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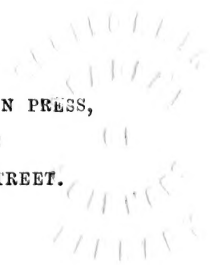
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"It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta. It will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease." SIR WM. JONES.  
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# JOURNAL

OF THE

## ASIATIC SOCIETY OF BENGAL.



Vol. LXVII. Part II.—NATURAL SCIENCE.

No. I.—1898.

*Materials for a Flora of the Malayan Peninsula.*—By GEORGE KING, K.C.I.E., M.B., LL.D., F.R.S., Superintendent of the Royal Botanic Garden, Calcutta.

No. 10.

I had hoped in the present contribution to have completed, for these *Materials*, my account of the whole of the remaining Natural Orders of *Calycifloræ*. This hope has, however, been frustrated by sickness. I have decided therefore to offer now to the Society the account of the five Orders which I have been able to elaborate; trusting, at some time in the near future, to deal with the remaining Orders of the Class. Following the sequence adopted by Sir Joseph Hooker in his *Flora of British India*, those treated of in the present paper come to be numbered as below; Nos. 48 *Lythraceæ*, 49 *Onagraceæ*, 50 *Samydaceæ*, 52 *Cucurbitaceæ*, and 56 *Araliaceæ*. And those which remain to be described would be Nos. 46 *Myrtaceæ*, 47 *Melastomaceæ*, 51 *Passifloraceæ*, 53 *Begoniaceæ*, 54 *Ficoideæ*, 55 *Umbelliferæ*, and 57 *Cornaceæ*. After finishing the *Calycifloræ*, I hope, in collaboration with my friend and successor, Dr. D. Prain, to describe the families which are embraced in the gamopetalous and apetalous groups.

### Order XLVIII. LYTHRACEÆ.

Trees, shrubs or herbs; branches often quadrangular. *Leaves* entire, opposite, sometimes alternate or whorled; stipules 0. *Inflorescence* various, often in cymes or panicles. *Flowers* hermaphrodite, regular,  
J. II. 1

rarely oblique, unisexual in *Cyrtperonia*. *Calyx-tube* free, persistent; lobes 3-6, valvate, some accessory often added. *Petals* as many as the calyx-teeth, rarely 0, inserted near the mouth of the calyx-tube. *Stamens* definite or numerous, inserted on the calyx-tube. *Ovary* free in the bottom of the calyx-tube (rarely inferior), 2-6-celled, style long; stigma capitate, rarely 2-lobed; ovules numerous, placentas axile (rarely parietal). *Fruit* coriaceous or membranous, free or more or less adnate to the base of the calyx, 2-6-celled or (by absorption of the partitions) 1-celled, dehiscent or indehiscent. *Seeds* numerous, various in shape, angular, sometimes winged; albumen none; embryo straight, (cotyledons convolute in *Sonneratia* and *Punica*.) **DISTRIB.** Species about 275 in tropical regions and especially in those of the New World; a few in temperate zones.

Tribe I. **AMMANNIÆ.** Herbs, mostly sub-aquatic, with small or minute flowers; the calyx membranous ... .. 1. **AMMANNIA.**

Tribe II. **LYTHREÆ.** Trees or shrubs with moderate or large-sized flowers (minute in *Cyrtperonia*), large often wrinkled petals, and coriaceous or herbaceous calyx.

Stamens not more than 12.

Calyx 6-toothed; petals 6; stamens 12; capsule circumscissile, 1-celled; seeds cuneate-obovate, angled ... .. 2. **PEMPHIS.**

Calyx 4- or 5-toothed; petals 0; flowers numerous, minute, racemose, sub-unisexual; stamens 4 or 5; capsule 2-celled and 2-valved; seeds minute, narrowly winged on one side ... .. 3. **CRYPTERONIA.**

Stamens indefinite.

Seeds free, not imbedded in pulp.

Stamens in 2 or more rows; capsule 3-6-celled; seeds large, winged laterally ... .. 4. **LAGERSTREMIÆ.**

Stamens in a single row; capsule 4-8-celled; seeds minute, narrowly winged at the upper margin ... .. 5. **DUABANGÆ.**

Seeds imbedded in pulp, angular; berry 10-15-celled ... .. 6. **SONNERATIÆ.**

### 1. **AMMANNIA**, Linn.

Annual glabrous herbs growing in damp places; branches often quadrangular. *Leaves* opposite and alternate, sometimes whorled, entire; stipules 0. *Flowers* small, axillary, solitary and subsessile, or in small trichotomous cymes; bracteoles usually 2. *Calyx* campanulate or tubular-campanulate, 3-5-toothed, often with minute interposed teeth or folds. *Petals* 3-5 or 0, small, inserted between the calyx-teeth. *Stamens* 2-8, inserted on the calyx-tube. *Ovary* enclosed in the calyx-tube, 1-5-celled, the septa very thin and often absorbed; style filiform or short, stigma capitate; ovules numerous, placentas axile. *Capsule* membranous, globose or elongated-ellipsoid, enclosed in the calyx, 2-3-valved,

irregularly breaking up, or circumscissile. *Seeds* many, small, smooth, round on the back and with a raphe on the inner face, ellipsoid or nearly hemispheric; placenta ultimately free central by the absorption of the dissepiments covered by the seeds. **DISTRIB.** Species 30; in the tropical or warm temperate zones of the whole world.

- Flowers sessile, calyx-tube elongate-campanulate, capsule ellipsoid, seeds narrowly oblong, falcate ... 1. *A. peploides*.  
 Flowers pedicelled, calyx-tube depressed-hemispheric, capsule depressed-globose, seeds sub-hemispheric ... 2. *A. baccifera*.

1. **AMMANIA PEPLOIDES**, Spreng. Syst. I, 444. *Flowers* in short axillary branches, sessile, solitary in the axils of reduced leaves; bracts in pairs, filiform, shorter than the tube of the calyx. *Calyx-tube* elongate-campanulate, almost smooth, its mouth with 4 acutely triangular teeth. *Petals* absent, or 4 and minute. *Capsule* 2-valved, ellipsoid; *seeds* narrowly oblong, sub-falcate, pink, angular, the hilum obscure. *Leaves* opposite, their midribs prominent; those of the flower-bearing branches linear-oblong, bearing a flower in the axil of each; those of the main stem elliptic or obovate, narrowed to the base and almost petiolate. *Stems* decumbent, often rooting, sometimes erect. Boiss. Flor. Orient. II, 742; Kurz in Journ. As. Soc. 1877, pt. II, 84; Clarke in Hook. fil. Flor. Br. Ind. II, 566. *A. nana*, Roxb. Flor. Ind. I, 427, (not of Wallich). *A. repens*, Rottl., DC. Prodr. III, 80. *Ameletia indica*, DC. in Mem. Soc. Hist. Nat. Genev. III, 11 (1825) 2, and 82, t. 3 f. A.; Prodr. III, 76; Wall. Cat. 2093; W. & A. Prodr. 303; Blume Mus. Bot. II, 135, t. 47; Dalz. & Gibs. Bomb. Flor. 96; Wight Ic. t. 257. *A. elongata*, Blume Mus. Bot. II, 135. *A. acutidens*, Miq. Flor. Ind. Bat. I, Pt. I, 617. *A. polystachya*, Wall. Cat. 2094. *A. latifolia*, Wall. Cat. 2096, (partly *Peplis indica*,) Willd. Sp. Pl. II, 244.

**SOUTH ANDAMAN**; near the settlements of Port Blair and Port Mowat; doubtless introduced as a weed of cultivation. **DISTRIB.** India, China, Persia; in rice and other fields.

2. **AMMANIA BACCIFERA**, Linn. Sp. Pl. 120. *Flowers* in very condensed axillary racemes or clusters shorter than the leaves; bracts filiform, shorter than the flower-pedicels. *Calyx-tube* widely campanulate, short, ridged; the teeth 4, broadly triangular, acute. *Petals* none or minute. *Capsule* depressed-globose, imperfectly circumscissile above the middle. *Seeds* sub-hemispheric, black, excavated on the plane face. *Leaves* opposite, rather distant, linear-oblong, sub-acute or obtuse, narrowed at the base, smaller upwards, 2-5 in. long. *Stem* erect, glabrous, 8-24 in. long. Blume Mus. Bot. Lugd. Bat. II, 133; Dalz. & Gibs. Bomb. Flor. 97; Kurz in Journ. As. Soc. 1877, Pt. II, 85; Clarke in Hook. fil. Flor. Br. Ind. II, 569. *A. vesicatoria*, Roxb. Hort. Beng. 11

Flor. Ind. I, 426; ed. Wall. I, 447; DC. Prodr. III, 78; W. & A. Prodr. 305; Wall. Cat. 2098, (partly). *A. indica*, Lamk. Ill. I, 311, No. 1555; DC. l. c. 77; W. & A. Prodr. 305; Wall. Cat. 2099; Blume l. c. t. 46. *A. debilis*, Ait. Hort. Kew, ed. 1, I, 163. *A. verticillata*, Boiss. Flor. Orient. II, 743, (not of Link). *Hapalocarpum vesicatorium* and *H. indicum*, Miq. Flor. Ind. Bat. I, Pt. I, 618. *Cryptotheca apetalata*, Blume Bijl. 1128; DC. l. c. 76.

PERAK; *King's Collector* 303; *Curtis* 3195. S. Andaman, in similar situations with the last.

## 2. PEMPHIS, Forst.

A maritime shrub or tree, 25–35 ft. high. *Leaves* opposite, oblong to oblong-lanceolate, entire, very thick, fleshy. *Flowers* small, axillary, solitary, peduncles 2-bracteate at their base. *Calyx-tube* campanulate, 12-∞-ribbed; teeth 6, short, with 6 shorter accessory teeth. *Petals* 6, inserted at the mouth of the calyx-tube and nearly as long, obovate, wrinkled, white or rose. *Stamens* 12, inserted in two series towards the middle of the calyx-tube. *Ovary* free at the bottom of the calyx-tube, 3-celled at the base; style long, stigma capitate; ovules many, ascending; placentas 3, sub-basal. *Capsule* coriaceous, obovoid or nearly globose, included in the calyx-tube or exerted nearly half its length, somewhat irregularly circumscissile, ultimately 1-celled. *Seeds* very many, long cuneate-obovoid, angular, smooth, standing out in all directions from the apparently free central placenta.

PEMPIS ACIDULA, Forst. Gen. t. 34. Young parts more or less clothed with grey silky hairs, the young branches 4-angled. *Leaves* subsessile or very shortly petioled, sub-acute or obtuse, .5–1.5 in. long. *Flowers* white. *Capsule* .4 in. long and .2 in. in diam. DC. Prodr. III, 89; Wall. Cat. 2108; W. and A. Prodr. 307; Griff. Notul. IV, 510; Blume Mus. Bot. II, t. 43; Miq. Flor. Ind. Bat. I, pt. I, 619; Bedd. Flor. Sylv. Anal. Gen. t. XIV, fig. 5; Kurz For. Flor. I, 518. *P. angustifolia*, Roxb. Hort. Beng. 91; Flor. Ind. II, 465. *P. setosa*, Lour. Flor. Filip. ed. I, 410. *Maclellandia Griffithiana*, Wight Ic. t. 1996. *Lythrum Pemphis*, Linn. f. Suppl. 249; Lamk. Ill. II, 408, fig. 2. *Melanium fruticosum*, Spreng. Syst. II, 445.

On the beech in SINGAPORE and probably in all the provinces. ANDAMAN and GREAT COCO ISLANDS; *Prairie*. DISTRIB. Burma, Ceylon, S. of British India.

## 3. CRYPTERONIA, Blume.

Trees. *Leaves* opposite, petioled, entire, ovate or lanceolate. *Racemes* elongate, in branched panicles. *Flowers* minute, white or green,



with short linear bracts at the base of the pedicels, polygamo-dioecious. *Calyx-tube* short, saucer-shaped, or longer and subhemispheric; teeth 5 (rarely 4), valvate, persistent. *Petals* 0. *Stamens* as many as the calyx-teeth, inserted between them near the mouth of the calyx-tube. *Ovary* free, 2-celled, with numerous horizontal or ascending ovules attached to the axile placentas; style long, filiform; stigma capitate, obscurely 2-lobed. *Capsule* surrounded at the base by the calyx, globose, pubescent, crowned by the persistent style, 2-celled, dehiscing so as to divide the style, fruit-pedicle deflexed. *Seeds* many, elongate-ellipsoid, narrowly winged on one side. **DISTRIB.** Species 5, extending from the Khasia Hills to the Philippine Islands.

Leaves membranous, usually narrowed to the base, nerves

5 or 6 pairs, calyx less than '1 in. in diam. ... .. 1. *C. paniculata*.

Leaves coriaceous, rounded or cordate at the base, nerves

7 or 8 pairs, calyx more than '1 in. in diam. ... .. 2. *C. Griffithii*.

1. **CRYPTERONIA PANICULATA**, Blume Bijdr. 1151. A tree 20–40 feet high; young branches glabrous or sometimes puberulous. *Leaves* membranous, oblong to oblong-lanceolate or more or less broadly elliptic, bluntly acuminate or blunt, narrowed to the base, entire, glabrous on both surfaces or slightly pubescent on the lower; main nerves 5 or 6 pairs, rather faint, curved; length 3–6 in., breadth 1·25–2·5 in. *Flowers* on short pedicels, very numerous, in long cylindrical pubescent or glabrous racemes longer than the leaves, the racemes often paniced. *Calyx* less than '1 in. in diam., its teeth triangular or triangular-lanceolate, acute. *Stamens* in the hermaphrodite flowers of the same length as the calyx-teeth, longer in the male flowers. *Capsules* globose-conic, puberulous or minutely velvety. Kurz in Journ. As. Soc. Beng. 187, Pt. II, 86; For. Flora Burma, I, 519. *C. pubescens*, Blume Mus. Bot. Lugd. Bat. II, 123; Clarke in Hook. fil. Flor. Br. Ind. II, 574; Griff. Notul. IV, 404; Ic. Pl. Asiat. t. 564, fig. II. *C. glabra*, Blume Mus. Bot. II, 123; Clarke in Hook. fil. Flor. Br. Ind. II, 574. *Henslowia pubescens*, Wall. Cat. 4904; Pl. As. Rar. III, 14 t. 221; Miq. Flor. Ind. Bat. I, Pt. I, 716; Planch. in Hook. Lond. Journ. Bot. IV, 477, t. XVI. *B. Henslowia Hookeri*, Wall. Cat. 8566. *H. affinis*, Planch. Lond. Journ. Bot. IV, 477 (*in part*). *H. leptostachys*, Planch. Lond. Journ. Bot. IV, 478. *H. glabra*, Wall. Cat. 4093; Pl. As. Rar. III, 14; Planch. in Hook. Lond. Journ. Bot. IV, 478; Miq. Flor. Ind. Bat. I, Pt. I, 716.

PENANG; *Porter*. MALACCA; *Maingay* (Kew Distrib. 650/2). PERAK; *King's Collector* No. 5205. ANDAMAN ISLANDS; very common; *King's Collector*. **DISTRIB.** Burma, Chittagong, Khasia.

I can find nothing better to distinguish the species which have been named

*C. glabra* and *C. pubescens* from each other than the presence on the latter of a small amount of hair, neither can I find any tangible character to separate either from *C. paniculata*, Blume. To the latter species, as the oldest, I therefore reduce both.

2. **CRYPTERONIA GRIFFITHII**, Clarke in Hook. fil. Flor. Br. Ind. II, 574. A tree 40–60 feet high; young branches glabrous. *Leaves* coriaceous, broadly elliptic, acute, very slightly narrowed to the rounded or cordate base, entire, glabrous on both surfaces; main nerves 7 or 8 pairs, distinct on the lower surface, curved, ascending; length 4–8 in., breadth 2.25–3.5 in. *Racemes* much longer than the leaves, rusty-pubescent, sometimes paniced; *flowers* numerous but not crowded, shortly pedicellate. *Calyx* rather more than .1 in. in diam., its teeth triangular. *Stamens* exerted. *Capsule* shorter than the calyx-teeth, velvety, less than .1 in. in diam., crowned by the long stout pubescent style. *Henslowiæ* sp. Griff. Notul. 406; Ic. Pl. Asiat. t. 564, fig. 1.

MALACCA; *Griffith* 2513. *Maingay* (Kew Distrib.) 651. *Derry* 1201. PENANG; *Curtis* 1739. PERAK; *Scortechini* 221. *Wray* 2589, 2638. *King's Collector* 3473, 4152, 8592.

#### 4. **LAGERSTRÆMIA**, Linn.

Trees or shrubs. *Leaves* opposite, distichous (or the uppermost alternate), entire, oblong or ovate. *Panicles* axillary and terminal, the ultimate branchlets usually cymose, sometimes dense; peduncles 2-bracteate at their apex; pedicels 2-bracteolate. *Flowers* often large. *Calyx-tube* funnel-shaped, smooth, grooved, angular or sub-alate; lobes 5-sometimes 7–9, ovate, subacute, valvate. *Petals* 6, sometimes 7–9 (or 0), inserted at the summit of the calyx-tube, clawed, wrinkled; margin crisped, erose, or fimbriate. *Stamens* very many, inserted in several rows near the bottom of the calyx-tube; filaments long, exerted. *Ovary* sessile in the bottom of the calyx, 3–6-celled; style long, bent, stigma capitate; ovules numerous, ascending, placentas axile. *Capsule* more or less adnate to the calyx, ellipsoid, coriaceous, smooth, 3–6-celled, 3–6-valved. *Seeds* many (rarely few), elongate, flat, erect, winged from their summit. **DISTRIB.** Species 18, in South-east Asia extending to Australia.

Inflorescence and exterior of calyx stellately ferruginous-tomentose ... .. 1. *L. floribunda*.

Inflorescence and outside of calyx minutely cinereous or whitish-velvety (the calyx sometimes rusty in *L. Flos-Reginæ*).

Leaves glaucous beneath; calyx 10-ribbed, the mouth with only 5 teeth ... .. 2. *L. hypoleuca*.

Leaves not glaucous beneath.

Calyx 8- or 9-ribbed, the teeth as many as the ribs and alternate with them; flowers 1·5 in. in diam.; leaves 2-3·25 in. long ... .. 3. *L. ovalifolia*.

Calyx 12-14-ribbed; the teeth half as many as the ribs, the ribs opposite the teeth broader; flowers 2-3 in. in diam.; leaves 3·5-8 in. long ... .. 4. *L. Flos-Reginæ*.

1. LAGERSTRÆMIA FLORIBUNDA, Jack in Mal. Misc. I, 38. A tree 15-30 feet high. *Leaves* ovate-oblong or elliptic-oblong, sub-acute, the base rounded, sub-sessile; main nerves 8-12 pairs, sub-horizontal or curving upwards; both surfaces minutely reticulate when dry, the upper glabrous and shining, the lower with deciduous stellate pale brown pubescence, or glabrous; length 5-7 in., breadth 2-2·75 in. *Panicle* much longer than the leaves, terminal, erect; the branches long, racemoid, the ultimate branchlets cymose, ascending, everywhere (as also the calyces,) covered with more or less deciduous wooly rusty pubescence. *Flowers* 1·5 in. in diam., on short pedicels. *Calyx* turbinate in bud, boldly 12-ridged, each alternate ridge passing into one of the 6 triangular calyx-teeth and often forming a mucro at its apex. *Petals* sub-orbicular, with wavy edges, rose-coloured changing to whitish. *Stamens* unequal, the outer rows the longest. *Capsule* ·5 in. long, elliptic, minutely cinereous-tomentose, half enveloped in the calyx, style persistent. DC. Prodr. III, 93; Wall. Cat. 2115; Miq. Flor. Ind. Bat. I, pt. I, 623 (not *Blume Mus. Bot. II, t. 41*); Griff. Notul. IV, 509; Kurz For. Flor. I, 522; Clarke in Hook. fil. Flor. Br. Ind. II, 577.

KEDAH; *Curtis* 2602. PENANG; *King*. TRANG; *King's Collector* 1407. MALACCA; *Maingay* (Kew Distrib.) 653/2. DISTRIB. Burma, Siam, China.

2. LAGERSTRÆMIA HYPOLEUCA, Kurz in Journ. As. Soc. Beng. for 1872 Pt. II, p. 30. A tree 60-70 feet high; all parts except the inflorescence glabrous. *Leaves* thickly membranous, oblong-lanceolate to elliptic or oblong-elliptic, shortly acuminate, the base rounded; main nerves 8-12 pairs, spreading, not prominent; both surfaces rather distinctly reticulate when dry, the upper shining, the lower glaucous; length 5-8 in., breadth 2-3 in., petiole ·3 in. long. *Panicles* minutely cinereous-velvety, longer than the leaves, terminal, few-branched, the branches with rather short cymose sub-horizontal branchlets. *Flowers* about 1·25 or 1·5 in. in diam., on jointed whitish unequal pedicels. *Calyx* turbinate in bud, minutely whitish-velvety, boldly 10-ribbed, the alternate ribs excurrent into the 5 triangular acute mucronate lobes of the mouth. *Petals* lilac, oblong, wavy, ·5 in. long. *Capsule* woody, oblong, mucronate, about ·65 in. long. For. Flor. Burm., I, 523; Clarke in Hook. fil. Flor. Br. Ind. II, 577.

ANDAMAN ISLANDS; *Kurz, Prain, King's Collectors.* GREAT COCO ISLAND; *Prain.*

3. *LAGERSTRÆMIA OVALIFOLIA*, Teysm. et Binn. in Nat. Tijdsch. Ned. Ind. II. (1840) 306. A tree 50 or even 100 feet high. *Leaves* oblong, ovate or oblong-obovate, acute, slightly narrowed to the base; main nerves 4 or 5 pairs, curved, ascending, slightly prominent on the lower surface when dry; upper surface greenish with minute black dots when dry, glabrescent except sometimes the minutely pubescent nerves; the lower brown when dry, glabrescent; length 2-3·25 in., breadth 1·25-2 in., petiole ·25 in. *Panicle* terminal, puberulous, 3-8 in. long, few-flowered; the branches few, sub-horizontal, cymose, puberulous below; the pedicels minutely velvety, cinereous. *Flowers* 1·5 in. in diam., on jointed velvety pedicels. *Calyx* turbinate, minutely cinereous-velvety, with 8 or 9 bold winged ridges not passing into the calyx-teeth. *Calyx-teeth* 8 or 9, acutely triangular, the edges thickened and reflexed. *Petals* (with claw) ·75 in. long, orbicular, clawed, purple, their edges slightly undulate. *Capsule* elliptic-ovoid, blunt, minutely velvety, ·75 in. long, and ·6 in. in diam. Kriudk. Arch. III, 440; Pl. Nov. Hort. Bog. (ed. Vriese) 20. Blume Mus. Bot. Lugd. Bat. II, 127; Miq. Flor. Ind. Bat. I, Pt. I, 624; Koorders and Valetton, Bijdr. I, 193. *L. celebica*, Bl. l. c. 127. *L. hexaptera*, Miq. Flor. Ind. Bat. I, Pt. I, 623; Clarke in Hook. fil. Flor. Br. Ind. II, 577.

MALACCA; *Maingay* (Kew Distrib. 653). PERAK; *King's Collectors* 8701, 10025 & 10532. PAHANG; *Ridley* 2640.

I can find no character to separate *L. hexaptera*, Miq. from the older species of Teysmann and Binnindik. Miquel's name is moreover an unhappy one, as the calyx-teeth are usually 9 and not 6.

4. *LAGERSTRÆMIA FLOS-REGINÆ*, Retz (1789) Obs. V, 25. A tree 30-60 feet high, all parts except the inflorescence glabrous. *Leaves* oblong to elliptic-oblong, acute, narrowed (rarely obtuse) at the base, shortly petiolate; main nerves 10-13 pairs, curving upwards, slightly prominent beneath when dry; both surfaces minutely reticulate, glabrous, the upper shining, the lower dull and of a dark brown colour when dry, length 3·5-8 in., breadth 1·75-3 in., petiole ·25-4 in. *Panicle* terminal, longer than the leaves, its ultimate branchlets cymose. *Flowers* from 2-3 in. in diam., on rather thick greyish unequal pedicels. *Calyx* turbinate, with 12-14 prominent stout ridges; those opposite the calyx-teeth broader, the mouth with 6-7 acute triangular spreading thick coriaceous teeth thickened at the edges. *Petals* sub-orbicular, clawed, corrugated and with undulate edges. *Stamens* all equal in length. *Capsule* oblong to sub-globose, minutely apiculate, ·8-1·25 in. long, and ·6-·75 in. in diam. *Kurz* in For. Flora Burm. I, 524; *Clarke* in

Hook. fil. Flor. Br. Ind. II, 577. *L. Munchhausia*, Lamk. Ency. III, 375; Ill. t. 473 fig. 2. *L. Reginæ*, Roxb. Pl. Corom. I, 46, t. 65; Hort. Beng. 38; Hook. fil. Flor. Br. Ind. II, 505; Blume Bijdr. 1127; DC. Prodr. III, 93; W. & A. Prodr. Flor. Penins. Ind. 308; Blume Mus. Bot. Lugd. Bat. II, 126; Miq. Flor. Ind. Bat. I, Pt. I, 623 and Suppl. 328. *L. speciosa*, Pers. (1807) Ench. II, 72 (not of DC.); Koehne in Engl. Bot. Jahrb. IV, 28; Koorders and Valetton, Bijdr. I, 190, (excl. from all where reduced the syn. *L. macrocarpa*, Wall.).

MALACCA, Singapore. PERAK. DISTRIB. Java, British India.

I have adopted Retz's name (published in 1789) for this plant, as it is pretty nearly certain what Retz's plant was. Koehne, Koorders and Valetton and others however adopt Persoon's name of *L. speciosa* on the ground that, although it dates from only 1807, it preserves the specific name of Linnæus (*Munchausenia speciosa* 1770). But this procedure is rendered inadmissible when Linnæus's description of that plant is consulted, for he describes *M. speciosa* as a *shrub*, whereas this plant is a large tree; moreover the rest of his description would apply to various other species of *Lagerstræmia*; the identity of *M. speciosa*, *L.* is thus quite uncertain. *L. macrocarpa* of Wall. Cat. 2114, is a tree of about the size of *L. Flos-Reginæ* and resembles it in most respects, but differs (1) in having leaves of larger size (5-12 in. long) more or less broadly elliptic, never oblong or elliptic-oblong, the apex often sub-acute and the base broad or narrowed into a petiole twice as long as that of *L. Flos-Reginæ*; (2) in the calyx being very slightly, if at all, furrowed and never ribbed, and (3) in having a larger more globose capsule (1-1.35 in. long and nearly as much in diam.). This tree has been in cultivation in the Bot. Garden, Calcutta, side by side with *L. Flos-Reginæ* for many years. It flowers earlier than the latter, has pink (not lilac) petals, and much larger capsules. In my opinion it is a good species and should not be merged in *L. Flos-Reginæ*. It is found only in Burma and Chittagong. Kurz, who was familiar with it in its wild state in Burma, considered it distinct and kept it as a species in his Forest Flora of British Burma.

### 5. DUABANGA, Ham.

Large glabrous trees with pendent quadrangular branches. *Leaves* opposite, distichous, large, short-petioled, elongated, acute, entire, cordate or rounded at the base. *Panicles* large, terminal, with opposite branches; flowers large. *Calyx-tube* wide, adnate to the base of the ovary; lobes 4-7, thick, valvate in the bud. *Petals* 4-7, clawed, obovate, crisped and undulate, white. *Stamens* very many, inserted on a perigynous ring. *Ovary* conical, 4-8-celled; style bent, long; stigma capitate, 4-8-lobed; ovules very many, ascending, placentas covering nearly the whole interior surface of the ovarian cells. *Capsule* sub-globose, surrounded at the base by the thick spreading calyx, coriaceous, perfectly or imperfectly 4-8-celled, 4-8-valved. *Seeds* very numerous, minute, ellipsoid, testa produced at both ends in two tails much exceeding the length of the nucleus. DISTRIB. Species 2; Eastern Himalaya, Assam and Malaya.

DUABANGA SONNERATIOIDES, Ham. in *Trans. Linn. Soc.* XVII, 178. A tree 60–100 feet high. *Leaves* thinly coriaceous, oblong to ovate-oblong, 7–12 in. long and 2.5–4 in. broad, glabrous, glaucous beneath. *Flowers* 2–2.5 in. across, on thick-jointed pedicels tapering to the base; panicle short, few-flowered, drooping. *Petals* 4–7, about 1 in. long. *Capsule* ovoid-globose, 1–1.5 in. in diam. Hook. fil. III. Him. Pl. t. 11; Kurz For. Flor. Burm. I, 525; Clarke in Hook. fil. Flor. Br. Ind. II, 579. *D. grandiflora*, Walp. Rep. II, 114. *Lagerstroemia grandiflora*, Roxb. Hort. Beng. 38; Flor. Ind. II, 503; DC. Prodr. III, 93; Wall. Cat. 2111; Blume Mus. Bot. I, 109. *Leptospartion grandiflorum*, Griff. Ic. Pl. Asiat. t. 591.

PERAK; *Scortechini*, King's Collector 5912. ANDAMANS AND NICOBARS, King's Collectors. DISTRIB. Burma, Assam, Khasia, Eastern Himalaya.

### 6. SONNERATIA, Linn. f.

Ever-green trees, growing near the sea, glabrous. *Leaves* opposite, petioled, coriaceous, entire. *Flowers* without bracts, large, three together at the summits of the branches, or axillary and solitary. *Calyx* thick, coriaceous; lobes 4–8, lanceolate, valvate. *Petals* 0, or as many as the calyx-lobes and linear-oblong. *Stamens* numerous, inserted in a circular band on the calyx-tube. *Ovary* nearly free, or adnate at the base to the calyx-tube, many-celled; style long, stigma capitate; ovules numerous, ascending, placentas axile. *Berry* subglobose, supported by the persistent calyx, 10–15-celled. *Seeds* very many, small, curved, angular, embedded in pulp; cotyledons convolute. DISTRIB. Species 4–5; on the tropical sea-shores of the Eastern hemisphere.

With petals	...	...	...	...	...	1. <i>S. acida</i> .
Without petals:—						
Calyx in bud ovoid, obtuse	...	...	...	...	...	1. <i>S. acida</i> , var. <i>Griffithii</i> .
Calyx in bud narrowly ellipsoid, tapering to both ends	...	...	...	...	...	2. <i>S. alba</i> .

1. SONNERATIA ACIDA, Linn. fil. Suppl. 252. A small tree 10–35 feet high, the branchlets jointed and 4-angled. *Leaves* oblong to oblong-obovate or obovate, tapering into a broad short petiole, blunt and sometimes retuse; length 2–3 in., breadth 1.35 to 2 in. in the obovate forms. *Flower-buds* solitary, ellipsoid, the calyx-tube not angled; the calyx when fully developed 1 in. long, its lobes 6–8, the lobes triangular, reflexed. *Petals* linear, slightly broader towards the apex than at the base. *Style* exerted, sometimes 3 in. long, stigma capitate. *Capsule* depressed-globose, sometimes as much as 2 in. in diam., the apex somewhat concave, the walls thick. Roxb. Hort. Beng. 38; Flor. Ind. II, 506; Roth Nov. Sp. 233; DC. Prodr. III, 231; Wall. Cat. 3641;

W. & A. Prodr. 327; Wight Ic. t. 340; Griff. Notul. IV, 652; Blume Mus. Bot. I, 336; Miq. Flor. Ind. Bat. I, Pt. I, 496; Dalz. & Gibs. Bomb. Flor. 98; Brand. For. Flor. 242; Kurz For. Fl. Burm. I, 526; Clarke in Hook. fil. Flor. Br. Ind. II, 580; Koorders and Valetton, Bijdr. I, 198. *Rhizophora caseolaris*, Linn. Sp. Pl. 635. *Aubletia caseolaris*, Gærtn. Fruct. I, 479, t. 78.

PENANG; *Curtis* 1108. PERAK; *Scortechini*, *Wray* 2494. ANDAMANS; *Kurz*, *Prain*, *King's Collectors*. DISTRIB. the coasts of Burma, the Deltas of the British Indian Rivers and of those of the Malayan Islands.

VAR. *Griffithii*, *Leaves* obovate, petals none. *S. Griffithii*, *Kurz* Pegu Report, App. B. 54; For. Flora Burma, I, 526; Clarke in Flor. Br. Ind. II, 580. *S. alba*, *Griff.* (not of *Smith*) Notul. IV, 652. *S. neglecta*, *Bl. Mus. Bot. Lugd. Bat. I*, 338; *Miq. Flor. Ind. Bat. I, Pt. I*, 498.

PERAK; *Scortechini* 967. DISTRIB. Burma.

The fruit of this variety is unknown; but the scanty material, so far as it goes, appears to show that the plant is merely an apetalous form of *S. acida* with leaves more obovate than is usual in that species. I have therefore reduced it to a form of the latter. Blume described other three species of *Sonneratia* with petals, viz., *S. obovata*, *S. evenia*, and *S. lanceolata* separating them chiefly by characters taken from the shapes of the leaves. But in this genus the form of the leaf is very variable, and I doubt whether these three species are more than forms of *S. acida*. *S. Pagapat*, *Blanco*, and *S. ovalis*, *Korth.* are probably also forms of it.

2. SONNERATIA ALBA, *Smith* in *Rees Cyclop.* XXXIII, No. 2. A small tree 10–15 feet high; young branches rather terete. *Leaves* obovate or obovate-reniform, decurrent on the short petiole, blunt or retuse, 2–4 in. long and nearly as broad, petiole .125–.25 in. *Flower-buds* narrowly ellipsoid, tapering to each end, very slightly ridged; the fully developed calyx sharply angled; its lobes 6–8, oblong-lanceolate, acute. *Petals* none. *Flowers* about the size of those of *S. acida*, usually 2 or 3 together. *Capsule* broadly obconic, ribbed, 1 in. or more in diam. at the apex. DC. Prodr. III, 231; Blume Mus. Bot. Lugd. Bat. I, 338; Miq. Flor. Ind. Bat. I, Pt. I, 497; Kurz For. Flora Burma I, 526; Clarke in Flor. Br. Ind. II, 580; Koorders and Valetton, Bijdr. I, 200. *S. Mossambicensis*, *Klotsch* in *Peters Reis. Mossamb. Bot. t. 12.* *S. acida*, *Benth.* (not of *Linn. fil.*) Flor. Austral. III, 301; *Hiern* in *Oliv. Flor. Trop. Afric. II*, 483; *Wall. Cat.* 3641 B.

SINGAPORE; *Wallich*. DISTRIB. Java, Moluccas.

#### Order XLIX. ONAGRACEÆ.

Herbs, rarely undershrubs, sometimes aquatic. *Leaves* opposite or alternate, entire or toothed, undivided (in *Trapa* the submerged leaves pinnatipartite), exstipulate. *Flowers* hermaphrodite, mostly axillary and solitary, or spiked or racemed towards the ends of the branches,

sub-irregular. *Calyx-tube* wholly adnate to the ovary (half-adnate in *Trapa*), limb with 2-5 valvate lobes. *Petals* epigynous, alternate with the calyx-lobes, rarely 0. *Stamens* as many or twice as many as the petals, inserted with them. *Ovary* inferior (half-inferior in *Trapa*), 1-6-celled, most often 4-celled; style 1, cylindric or subulate, stigma capitate or nearly 2-lobed or 4-fid; ovules one or many in each cell, pendulous or half-ascending, placentas axile. *Fruit* various, dehiscent or indehiscent, membranous capsular or bony, 1- or several-celled, 1 or  $\infty$ -seeded. *Seeds* without albumen, or nearly so. **DISTRIB.** Species 300, spread throughout the world, most abundant in the North Temperate Zone.

Stamens twice as numerous as the calyx-lobes ...	... 1. JUSSLÆA.
Stamens equal in number to the calyx-lobes ...	... 2. LUDWIGIA.

### 1. JUSSLÆA, Linn.

Herbaceous or suffruticose, sub-aquatic. *Leaves* simple, alternate, usually entire. *Flowers* white or yellow, solitary, axillary; pedicel usually bibracteate at the apex. *Calyx-tube* narrow, only slightly produced above the ovary; its teeth 4-6, acute, persistent. *Petals* 4-6, epigynous. *Stamens* also epigynous, twice as numerous as the petals. *Ovary* inferior, 4-5-celled; style simple, usually very short, the stigma 4- or 5-lobed; ovules numerous, axile, in several vertical rows at the inner angle of each cell. *Capsule* narrow, cylindric or angled, 4- or 5-celled, 8-10-ribbed, dehiscing septicidally. *Seeds* very numerous, without coma. **DISTRIB.** Species 30, tropical, chiefly American.

JUSSLÆA SUFFRUTICOSA, Linn. Sp. Pl. 555. Erect, branching, 1-4 feet high. *Leaves* lanceolate, ovate-lanceolate or almost linear, acute or acuminate, narrowed to the base, villous, pubescent or sub-glabrous, 2-3 in. long, and .25-.75 in. broad, sessile or very shortly petioled. *Flowers* .5-.75 in. in diam., on very short pedicels, the bracts small or foliaceous. *Petals* wholly yellow. *Capsule* linear, cylindric, 1-2 in. long, membranous, not woody, 8-ribbed, deciduously villous or pubescent. *Seeds* sub-hemispheric; the testa with a prominent raphe, shining, brown, not corky. DC. Prodr. III, 58; Wall. Cat. 6334; Miq. Flor. Ind. Bat. I, Pt. I, 628; Kurz in Journ. As. Soc. 1877, Pt. II, 90; Clarke in Flor. Br. Ind. II, 587. *J. exaltata*, Roxb. Hort. Beng. 33; Flor. Ind. II, 401. *J. villosa*, Lamk. Dict. III, 331; DC. Prodr. III, 57; Wall. Cat. 6333; W. & A. Prodr. 336; Gibs. & Dalz. Bomb. Flor. 98. *J. fruticosa*, DC. l. c. *J. scabra*, Willd.; DC. l. c. *J. Burmanni*, and *octophila*, DC. l. c. *J. longipes*, Griff. Notul. IV, 689. *J. decumbens*, Wall. Cat. 6322. *J. angustifolia*, Lamk. Dict. III, 331 and III, t. 280, fig. 3; DC. Prodr. III, 55; Miq. Flor. Ind. Bat. I, Pt. I, 627. *Epilobium fruticosum*, Lour. Flor. Cochinchina 226. Rheede Hort. Mal. II, t. 50.



SINGAPORE; PENANG; PERAK; ANDAMAN ISLANDS, and probably in all the other provinces; DISTRIB. British India, Ceylon.

A widely distributed plant to which many names have been given. It is readily distinguished from *J. repens*, Linn. (the only other species common to the tropics of both worlds) by its narrower leaves, membranous capsule and erect habit.

2. LUDWIGIA, Linn.

Herbs. *Leaves* alternate, undivided, sub-entire. *Flowers* usually axillary, solitary, sessile or nearly so, peduncle 2-bracteate at its apex. *Calyx-tube* scarcely produced above the ovary, linear in the Indian species; teeth 3-5, acute, persistent. *Petals* 3-5 (or 0), epigynous, yellow. *Stamens* equal in number to the calyx-segments, epigynous. *Ovary* inferior, 4-5-celled; style simple, stigma capitate; ovules very many, attached in 2 or more vertical rows to the inner angle of each cell. *Capsule* linear or oblong (in the Indian species), 4-5-celled, opening by terminal pores or breaking up irregularly along the sides. *Seeds* numerous, obovoid, smooth, raphe obscure or prominent but not large, without coma. DISTRIB. Species 20, mostly in North America; extending from the cool temperate zone to the equator; chiefly inhabiting marshes.

- |   |     |     |                           |
|---|-----|-----|---------------------------|
| Capsules inflated, seeds in several rows                            | ... | ... | 1. <i>L. parviflora</i> . |
| Capsules filiform, not inflated; seeds in a single row in each cell | ... | ... | 2. <i>L. prostrata</i> .  |

1. LUDWIGIA PARVIFLORA, Roxb. Hort. Beng. 11; Flor. Ind. I, 419. An erect glabrous herb 8-24 in. high. *Leaves* lanceolate, linear-lanceolate or linear-oblong, narrowed to each end, 1-3 in long, and .25-.75 in. broad. *Flowers* on short pedicels, usually 4-fid. *Petals* small. *Capsule* inflated, obsoletely 4-angled, smooth, crowned for sometime by the persistent calyx-teeth, .35-.5 in. long. *Seeds* in many rows in each cell. DC. Prodr. III, 59; Wight Ill. t. 101; W. & A. Prodr. 336; Dalz. & Gibs. Bomb. Flor. 99; Benth. Flor. Austral. III, 307; Boiss. Flor. Orient. II, 752; Kurz in Journ. As. Soc. 1877, Pt. II, 91; Clarke in Hook. fil. Flor. Br. Ind. II, 588. *L. lythroides*, Blume Bijd. 1134; DC. l. c. *D. jussieoides*, Wall. Cat. 6335 (not of Linn. and others).

PERAK; *Scortechini* 442; *Wray* 2720. DISTRIB. British India and Ceylon.

2. LUDWIGIA PROSTRATA, Roxb. Hort. Beng. 11; Flor. Ind. I, 420. *Stem* prostrate, or decumbent at the base and then erect, 8-24 in. long, glabrous. *Leaves* lanceolate or linear-lanceolate, acute or acuminate, tapering to the base, 2-4 in. long and .35-.75 in. broad. *Flowers* sometimes more than one in an axil, sessile, 4-fid. *Petals* lanceolate, longer than the calyx. *Capsule* 4-angled, thin, filiform, not at all inflated,

smooth, crowned by the linear calyx-teeth; length .5–1 in. diam. .02 in. *Seeds* oval, in a single row in each cell. DC. Prodr. III, 59; Wight Ic. t. 762; Kurz in Journ. As. Soc. 1877, Pt. II, 91. Clarke in Flor. Br. Ind. II, 588. *L. diffusa*, Ham. in Trans. Linn. Soc. XIV, 301; Wall. Cat. 6336; DC. l. c. *L. fruticulosa*, Blume Bijdr. 1133; DC. l. c. *Nematopyxis prostrata, pusilla, and fruticulosa*, Miq. Flor. Ind. Bat. I, Pt. I, 630.

PERAK; *Curtis* 3183. SINGAPORE; *King's Collector* 58. ANDAMANS; *King's Collector*. DISTRIB. Burma, Cachar, Sylhet, Assam, and the base of the Eastern Himalaya.

A species closely resembling *L. parviflora*, but readily distinguished by having very slender capsules, through the walls of which the seeds may be distinguished lying in single row in each cell; whereas in *L. parviflora* the seeds are in several rows in each cell and are undistinguishable on the outside of the thick walls of the short inflated capsules.

#### Order L. SAMYDACEÆ.

Trees or shrubs. *Leaves* alternate, often distichous, petioled, rarely sessile, simple, entire or slightly crenate or serrate, often closely punctulate beneath; stipules small, deciduous. *Flowers* regular, small, axillary, shortly pedicelled, densely fasciated or in long simple or paniced racemes. *Calyx* coriaceous, persistent; tube short, free, or longer and adnate to the ovary; limb 3–7-fid. *Petals* as many as the calyx-lobes (or 0), perigynous, imbricated. *Stamens* definite or indefinite, often with staminodes between or united in a tube with them. *Ovary* superior or half-superior, 1-celled; style 1, capitate or 3-fid at the apex, or styles 2–5; ovules many or several, placentas 2–5 (usually 3), parietal. *Fruit* loculicidally 2–5- (usually 3-) valved, valves carrying the seeds on their mesial line. *Seeds* several (usually few, sometimes many), oblong or angular, albuminous, usually drilled. DISTRIB. Species 180, scattered through the tropical regions of the globe, rarely also in the subtropical.

Flowers without petals:—

Flowers in axillary glomeruli, rarely solitary ... .. 1. CASEARIA.

Flowers in long slender racemes or panicles ... .. 2. OSMELIA.

Flowers with petals; flowers in axillary or terminal racemes  
or panicles ... .. 3. HOMALIUM.

##### 1. CASEARIA, Jacq.

Shrubs or small trees. *Leaves* alternate, distichous, petioled, undivided, entire or slightly serrate, often minutely punctate; stipules small, lateral, caducous. *Flowers* small, greenish-yellow, clustered in the axils (in the Indian species); pedicels short, jointed above their bases, surrounded by small scales. *Calyx* inferior, deeply 4–5-lobed;

lobes imbricate, obtuse, persistent. *Petals* 0. *Stamens* double the number of the calyx-lobes or thereabout, united in a tube with staminodes alternating with the free portion of the filaments; staminal tube hypogynous, sometimes very short so that the filaments are nearly or quite free. *Ovary* free, ovoid, 1-celled, style simple, stigma capitate or 3-fid; ovules many, parietal. *Fruit* succulent, globose or ovoid, ellipsoid (when dry somewhat 3-angular or 6-ribbed), 3-rarely 2-valved. *Seeds* many, angular or obovoid, with a fleshy usually coloured aril; embryo straight. **DISTRIB.** Species 140, in the warmer parts of the whole globe, most plentiful in America.

Leaves pubescent on the lower surface, glabrescent on the upper:—

Leaves narrowed or rounded, but never cordate or truncate, at the base; glomeruli few-flowered ...

1. *C. Lobbiana.*

Leaves cordate or truncate at the base; glomeruli many-flowered ...

2. *C. grewiæfolia.*

Leaves glabrous on both surfaces:—

Fruit not exceeding 1 in. in length and usually much shorter:—

Leaves broadly elliptic, shortly acuminate, thinly membranous; calyx-teeth 4 ...

3. *C. albicans.*

Leaves elliptic-oblong, thinly coriaceous or membranous, main nerves 10–12 pairs; stamens 10 ...

4. *C. andamanica.*

Leaves elliptic-oblong to elliptic-lanceolate, main nerves 6–8 pairs; stamens 8 ...

5. *C. esculenta.*

Fruit large, fleshy, 1·5–2 in. long; leaves narrowly oblong; coriaceous.

Flowers in glomeruli:—

Leaves tapering slightly to base and apex; fruit apiculate ...

6. *C. Kunstleri.*

Leaves acute at the apex, sub-acute at the base; fruit not apiculate ...

7. *C. Clarkei.*

Flowers solitary or in fascicles of 2, axillary ...

8. *C. macrocarpa.*

1. **CASEARIA LOBBIANA**, Turcz. in Bull. Soc. Nat. Mosc. (1858), XXXI, Pt. I, 463. A slender tree 15–20 feet high; young branches slender, densely tawny-pubescent. *Leaves* oblong or oblong-lanceolate, shortly acuminate, the base rounded or narrowed; upper surface glabrescent, the midrib and nerves pubescent; lower surface sparsely pubescent, densely so on the midrib and nerves; main nerves 8–10 pairs, curving upwards, length 2–5 in., breadth ·75–2·25 in.; petioles ·2–3 in., tomentose, slender. *Flowers* few together in the leaf-axils, on very short pedicels, glabrescent. *Calyx-teeth* triangular, acute, reflexed. *Staminodes* villous, rather shorter than the stamens. *Fruit* almost sessile and nearly globose, orange-yellow when ripe, ·5 in. long and ·4 in. in diam. Clarke in Hook. fil. Flor. Br. Ind. II, 594.

SINGAPORE; *Lobb*. PERAK; *King's Collector* 2377, 2631, 10731; *Wray*; 829, 2594; *Scortechini* (without number). DISTRIB. Tenasserim.

2. CASEARIA GREWIAEFOLIA, Vent. Choix. 48. A small tree; young branches 4-angled, densely rusty-tomentose. *Leaves* oblong, acute, not at all or very little narrowed to the cordate sub-truncate base, the edges entire or minutely crenulate; upper surface shining, almost glabrous, the lower surface pellucid-punctate when fresh, tomentose on the midrib and 10-14 pairs of little-curved ascending main nerves, otherwise sparsely pubescent; length 4.25-6 in., breadth 1.25-2.35 in., petiole .2 in. *Glomeruli* many-flowered, chiefly from the axils of fallen leaves; the flower-pedicels slender, .25 in. long, minutely pubescent, articulated at the base. *Flower-bud* .15 in. long; sepals minutely adpressed-pubescent, adnate at the base to the short staminal column. *Stamens* 8, the glabrous filaments alternating with the 8 pubescent staminodes. *Ovary* pyramidal, hairy at its junction with the style. *Fruit* compressed-ellipsoid, nearly 1 in. long, glabrous, boldly ridged when dry. DC. Prodr. II, 51; Miq. Flor. Ind. Bat. I, Pt. I, 706; Clarke in Flor. Br. Ind. II, 594. *C. variabilis*, Blume Mus. Bot. Lugd. Bat. I, 252. *C. subcuneata*, Miq. Flor. Ind. Bat. I, Pt. I, 706. *C. cinerea*, Turcz. in Bull. Soc. Nat. Mosc. (1858), XXXI, Pt. I, 462.

MALACCA; *Maingay* (Kew Distrib.) 659, 661. PERAK; *Scortechini*; 2003. DISTRIB. Java, Bali, and other Islands of the Malay Archipelago.

3. CASEARIA ALBICANS, Wall. Cat. 7197. A shrub 3 or 4 feet high; young branches slender, very pale, almost white when dry, glabrous. *Leaves* thinly membranous, pale brown when dry and much pellucid-punctate, more or less broadly elliptic, shortly acuminate; the base rounded or very slightly narrowed, the edges entire, both surfaces glabrous and finely reticulate when dry; main nerves 8 or 9 pairs, curved, ascending; length 4-7.5 in., breadth 2.25-4 in., petiole .25 in. *Glomeruli* small, few-flowered, axillary; flower-buds obovoid, almost sessile, surrounded by numerous acute bracteoles. *Calyx-teeth* 4, broadly triangular, glabrous. *Fruit* broadly ovoid, compressed, acute, subglabrous, 1 in. long and .65 in. in its broad diameter. "*Samydeæ*," Wall. Cat. 7432.

PENANG; *Wallich*. PERAK; *King's Collector* 3634.

The above description is drawn up from the two sheets of Wall. Cat. above quoted and of King's Collector 3634. One of Wallich's specimens 9197 has fruit in a pocket detached from the twig, the others have no fruit. The plant here named *C. albicans* is not, however, that described under the same name by Mr. C. B. Clarke in the Flora of British India. Mr. Clarke's plant is 660 of *Maingay's* Herbarium, and is referred by me (along with 660/2) to *C. macrocarpa*, Clarke.

4. CASEARIA ANDAMANICA, new species. A tree 20-40 feet high; young branches pale brown, glabrous. *Leaves* oblong-elliptic, acute,

slightly narrowed and somewhat oblique at the very base; both surfaces glabrous, minutely reticulate when dry; main nerves 10–12 pairs, spreading, curving upwards, slightly prominent beneath; length 6–9 in., breadth 2·75–3·5 in., petiole ·5–·75 in. *Glomeruli* axillary, large and many-flowered; buds sub-globular, glabrous; pedicels about ·25 in. long glabrous, the bracteoles minute. *Calyx-segments* ovate, glabrous; staminal tube wide, nearly glabrous, adherent below to the sepals; filaments 10, as long as the tube and as the alternating villous staminodes. *Ovary* elongate-pyramidal, 3-angled, stigma capitate; fruit unknown.

ANDAMAN ISLANDS; *King's Collectors.*

5. *CASEARIA ESCULENTA*, Roxb. Flor. Ind. II, 422. A shrub or small tree as high as 20 or 30 feet; young branches pale, striate when dry, glabrous. *Leaves* thinly coriaceous, elliptic-oblong to elliptic-lanceolate, acute at the apex and acute or obliquely rounded at the base, the edges entire; both surfaces reticulate; main nerves 6–8 pairs, spreading, not prominent; length 3–7 in., breadth 1·5–2·25 in., petiole ·25 in. *Glomeruli* axillary, many-flowered; buds and pedicels glabrous, the latter ·2–·25 in. long; bracteoles very short, glabrous. *Calyx-teeth* 4, broadly ovate, concave. *Stamens* 8, alternating with the staminodes. *Ripe fruit* ellipsoid to globular-ovate, glabrous, dehiscent by 2 or 5 valves, length ·75 in. or more. Clarke in Flor. Br. Ind. II, 592. *C. lævigata*, Dalz. in Hook. Journ. Bot. IV, 107; Dalz. & Gibs. Bomb. Flor. 11. *C. Championii* and *C. Zeylanica*, Thwaites, Enum. Pl. Ceylon, 19. *C. varians*, Thwaites Enum. 19 (*in part*).

SINGAPORE; *Lobb, Griffith, Maingay* (Kew Distrib.) 657.

PERAK; *Ridley* 5218; *Scortechini* 804; *King's Collector* 4699, 7001.

A widely distributed species presenting a considerable amount of variation. Perak specimens have larger leaves than those from British India; but they appear to have smaller fruits; for Roxburgh describes the fruit of the plant, as it grows in the Northern Circars, as being as large as a nutmeg.

6. *CASEARIA KUNSTLERI*, King n. spec. A tree 30–80 feet high; young branches pale, glabrous. *Leaves* coriaceous, narrowly oblong, tapering slightly to each end, the edges entire; both surfaces glabrous and minutely reticulate; the upper shining, the lower rather dull; main nerves 7 or 8 pairs, ascending and only slightly curved, prominent on the lower surface; length 5–7 in., breadth 1·5–2 in.; petiole ·25 in., stout. *Glomeruli* mostly in the axils of fallen leaves, many-flowered; pedicels stout, glabrous ·35–·45 in. long; buds ·15 in. long, blunt. *Calyx* 5-cleft, the segments broadly ovate, obtuse, concave, minutely pubescent. *Stamens* 10, broad, sub-acute, the filaments broad, pointed, their edges pubescent. *Staminodes* elliptic, their apices acute and

pubescent. *Ovary* broadly ovate, 5-celled; the stigma capitate-discoid, almost sessile. *Fruit* bright yellow, broadly ovoid or obovoid, apiculate, tapering also to the base, glabrous, 1.5–2 in. long and .75–1.35 in. diam., pulpy and smooth when ripe, boldly 3-angled when dry.

PERAK; *Wray* 3752; *King's Collector* 3694, 6936, 7118.

This resembles both *C. macrocarpa* and *C. Clarkei* in several respects, but it has larger and more numerous flowers, and the fruit is broader, in proportion to its length, than is the case in either of these species. The leaves are less shining and reticulate than those of *C. macrocarpa*, but they closely resemble those of *C. Clarkei*.

7. CASEARIA CLARKEI, King. A tree; young branches thick, glabrous, striate. *Leaves* coriaceous, narrowly oblong, acute at both base and apex, both surfaces glabrous, the upper shining; main nerves 5–7 pairs, slightly curved, ascending, prominent beneath; length 5–10 in., breadth 1.5–2.75 in., petiole .25–.4 in. long. *Glomeruli* very condensed, axillary, many-flowered; pedicels .25 in. long, glabrous like the buds. *Ripe fruit* ovoid, bright yellow, 2 in. long and 1.25 in. in diam. *C. albicans*, Clarke in *Flor. Br. Ind. II*, 593 (not of Wallich).

MALACCA; *Maingay* (Kew Distrib.) 660. SINGAPORE; *Ridley* 6334.

This species resembles *C. macrocarpa* Clarke, but has smaller fruit. Its leaves are moreover larger, less shining and less reticulate, and the glomeruli are much more numerous flowered.

8. CASEARIA MACROCARPA, Clarke in *Hook. fil. Flor. Br. Ind. II*, 593. A small tree; young branches reddish, glabrous. *Leaves* narrowly lanceolate, acute or acuminate, the base narrowed, the edges entire; both surfaces glabrous, shining, minute, reticulate when dry; main nerves about 5 or 6 pairs, curved, ascending, length 4–6 in., breadth 1 to 1.5 in., petiole .3–.4 in. long. *Glomeruli* axillary, one- or few-flowered; pedicels about .15 in. long, glabrous, the buds glabrous outside, reddish; calyx-teeth 5, oblong, blunt, minutely velvety inside. *Fruit* obovoid or ellipsoid, compressed, 1.5–1.75 in. long by .65 in. broad; seeds obovoid, compressed.

PENANG; *Maingay* 660/2; *Curtis* 229 and 960.

## 2. OSMELIA, Thwaites.

*Trees.* *Leaves* alternate, petioled, ovate or oblong-lanceolate, entire or obscurely serrate, epunctate; stipules minute, deciduous. *Flowers* small, very nearly sessile, in long simple or paniced racemes. *Calyx* inferior, divided nearly to the base; lobes 4 or 5, rounded, imbricate. *Petals* 0. *Stamens* 8 or 10, half alternating with as many 2-lobed hairy scales and half inserted in the notches of those scales. *Ovary* superior, 1-celled; styles 3, short, with capitellate or bifid stigmas; ovules few;

placentas 3, parietal. *Capsule* subglobose, 3-valved. *Seeds* few, subglobose, with a red fleshy aril. **DISTRIB.** Species 6; Malaya, Philippines, Ceylon.

**OSMELIA MAINGAYI**, King n. spec.. A dioecious tree 20–60 feet high; young branches slender, minutely tawny-tomentose. *Leaves* membranous, oblong or elliptic-oblong to elliptic, shortly acuminate, the base rounded or slightly narrowed, the edges entire or very obscurely crenate; the upper surface glabrous, the lower covered with minute yellowish pubescence especially on the nerves and midrib; main nerves 6–10 pairs, curved, spreading, interarching within the edge; length 4–6 in., breadth 1.75 to 3 in., petiole .6–.75 in. *Male panicles* slender, terminal, several times as long as the leaves; flowers .1 in. in diam. or less, on short pedicels bracteate at the base, in slightly distant small glomeruli. *Sepals* 4, membranous, imbricate, rotund, pubescent, concave. *Petals* 0. *Stamens* 8 in two rows, one row with longer filaments alternating with the row opposite the broad villous glands. *Panicles of female flowers* axillary, shorter than the leaves, slightly longer in fruit. *Calyx* as in the male, but the segments smaller. *Stamens* subequal, shorter than the calyx, the filaments very short, glands and ovary densely hairy; the latter sub-globular, tomentose, crowned by 3 short distant bifid glabrous stigmas, 1-celled; ovules 3, erect. *Capsule* .5–.65 in. long, 3-ridged, dehiscing by 3 valves.

**MALACCA**; *Maingay* (Kew Distrib.) 1448. **PERAK**; *Scortechini* 158, 191, 623. *King's Collector* 741, 1240, 2339, 4259, 4096, 5667, 7660, 7045, 10017, 10981; *Wray* 3665. **PAHANG**; *Ridley* 2654. **SINGAPORE**; *King, Ridley* 3804, 1904.

This appears to be a very common tree in Perak; for there is large suite of specimens of it in the Calcutta Herbarium numbering about 150 sheets. The various gatherings vary somewhat as to the amount of pubescence and number of nerves on the leaves, as also in the length of the panicles; but I cannot make out more than one species. Maingay's specimen (Kew Distrib.) 1439 looks as if it might be different. There is only a single sheet of it at Calcutta, and no flower remains on its panicles. Beccari's Sumatra plant 928 may possibly belong to still another species. All the species have the *facies* of *Antidesma*; the capsular fruit when present however at once distinguishes them from that genus.

### 3. HOMALIUM, Jacq.

Shrubs or trees. *Leaves* alternate, crenate or subentire, petioled or sessile, rarely punctulate. *Flowers* hairy, small, in slender axillary and sub-terminal simple or paniced racemes; bract at the base of the pedicel often prominent but caducous. *Calyx-tube* funnel-shaped or cylindric, adnate to the base of the ovary; lobes 5–10, narrow, persistent. *Petals* 5–10, inserted in the throat of the calyx, linear-oblong, persistent. *Disc*

tomentose. *Stamens* solitary or in fascicles of 2–7, opposite the petals, alternating with large glands. *Ovary* half-superior, 1-celled; styles 2–5, filiform, stigmas capitellate; ovules many or several; placentas parietal, extending only down the upper free portion of the ovary. *Capsule* half-superior, coriaceous, 2–5-valved at the apex. *Seeds* few, angular or oblong. **DISTRIB.**—Species 50, scattered over the hot regions of nearly the whole globe.

Flowers never more than .35 in. in diam. :—

*Stamens* 1 opposite each petal; leaves glabrous ... 1. *H. longifolium*.

*Stamens* 2 in front of each petal; calyx-tube funnel-shaped :—

Leaves glabrous, glaucous beneath; flowers 6-merous ... .. 2. *H. Kunstleri*.

Leaves glabrous except on the midrib beneath, not glaucous; flowers 6- or 7-merous ... 3. *H. propinquum*.

Leaves sparsely pubescent on both surfaces, the midribs tomentose; flowers 10-merous ... 4. *H. Griffithianum*.

*Stamens* 4 in front of each petal; flowers 6-merous, calyx-tube cylindric, expanding very slightly at the mouth ... .. 5. *H. frutescens*.

Flowers .6–.75 in. in diam. :—

*Stamens* 4 in front of each petal; calyx-teeth 5, much smaller than the petals ... .. 6. *H. undulatum*.

*Stamens* 7–9 opposite or sub-opposite to each petal; calyx-teeth 7–9, larger than the petals and accrescent 7. *H. grandiflorum*.

1. *HOMALIUM LONGIFOLIUM*, Benth. in Journ. Linn. Soc. IV, 35. A tree 30–60 feet high; young branches slender, lenticellate, almost glabrous. *Leaves* coriaceous, oblong or oblong-lanceolate, acute or shortly and bluntly acuminate, the base narrowed; the edges entire, sometimes slightly undulate; both surfaces quite glabrous, the lower darkest when dry; main nerves 7–9 pairs, spreading, curved, faint; length 3–4.5, in., breadth 1.5–1.75 in.; petiole .3 in., stout. *Racemes* slender, axillary, solitary, rarely branched, 4–7 in. long, covered with minute white tomentum. *Flowers* .15 in. across, almost sessile, in fascicles of 3 or 4, 6-fid. *Calyx-tube* narrow, its segments lanceolate like the petals but broader. *Stamens* one opposite to each petal alternating with yellow-glands. *Fruit* unknown. Clarke in Flor. Br. Ind. II, 596. *Blackwellia macrostachya*, Turcz. in Bull. Soc. Imp. Mosc. 1863 (Vol. XXXVI), 610.

PENANG; *Phillips*, *Curtis* 201. MALACCA; *Maingay* (Kew Distrib.) 665; *Derry* 994. PERAK; *King's Collector* 4444, 7855, 10230, 10763; *Scortechini* 487, 2036. SELANGOR; *Scortechini* 1910.

2. *HOMALIUM KUNSTLERI*, n. spec. King. A tree 30–40 feet high; young branches glabrous, rather slender, smooth, glaucous. *Leaves*



coriaceous, oblong-elliptic, shortly acuminate, narrowed or rounded at the base, sometimes oblique; the edges remotely crenate, revolute when dry; both surfaces glabrous, the lower glaucous; main nerves 8 or 9 pairs, faint, curving upwards; length 4.5–7 in., breadth 2.25–2.75 in.; petiole .2–.3 in., thick. *Racemes* solitary, axillary, slightly longer than the leaves, bearing rather distant glomeruli of 3 or 4 flowers each, the rachis densely and minutely tomentose. *Flowers* .3 in. in diam., the pedicels about .1 in. long. *Calyx-tube* short, widely funnel-shaped; teeth 6, oblanceolate, obtuse, spreading, minutely tomentose externally. *Petals* 6, broadly lanceolate, sub-acute, equal in length to the calyx-teeth, villous on the inner surface. *Stamens* 2 in front of each petal; the filaments glabrous rising from a small bulb. Ovary hairy. Styles 5, short, sub-erect.

PERAK; *King's Collector* 4286, 7109.

3. HOMALIUM PROPINQUUM, C. B. Clarke in Flor. Br. Ind. II, 597. A tree 60–80 or even 120 feet in height; young branches pale brown when dry, puberulous. *Leaves* coriaceous, elliptic to elliptic-obovate, obtuse, or shortly acuminate, more or less narrowed and sometimes slightly oblique at the base, the edges undulate- or undulate-crenate; both surfaces glabrous, the midrib alone sometimes puberulous beneath; main nerves 9–11 pairs, curved, spreading, prominent beneath when dry; length 4–7 in., breadth 2.25–3.5 in.; petiole .25–.35 in. *Racemes* 4–12 in. long, clustered and sometimes paniced at the apices of the branches, covered with soft pale tomentum. *Flowers* .2 in. in diam., 6 or 7-fid, in close clusters and on pedicels .15 in. long. *Calyx-tube* funnel-shaped; its segments longer than the petals, subspathulate. *Stamens* twice as many as the petals, all bearing anthers. *Fruit* unknown. *H. longifolium*, (*in part*) Benth. in Journ. Linn. Soc. IV, 35. *Blackwellia propinqua*, Wall. Cat. 4898. *B. spiralis*, Wall. Cat. 4897A.

PENANG; *Porter, Curtis* 1592. PERAK; *King's Collector* 3748, 3935, 4883, 7936. MALACCA; *Griffith*; *Maingay* (Kew Distrib.) 664.

4. HOMALIUM GRIFFITHIANUM, Kurz in Journ. As. Soc. Bengl. XL, Pt. II, (for 1877), 57. A tree 30–40 feet high, the young parts softly tawny-pubescent. *Leaves* membranous, obovate-oblong, shortly and bluntly apiculate, slightly narrowed to the rounded or minutely subcordate base, the edges subentire to coarsely crenate; both surfaces sparsely pubescent, tomentose or densely pubescent on the midrib and 7–9 pairs of spreading little curved not prominent main nerves; length 2.75–5 in., breadth 1.65–2.5 in.; petiole .2–.4 in., pubescent. *Racemes* solitary, one and a half times as long as the leaves, softly tawny-tomentose; the glomeruli few-flowered, not crowded together. *Flowers* .35 in. in diam., densely villous in all parts. *Calyx-tube* conical

expanding into a wide mouth; the teeth 10, linear. *Petals* oblanceolate or spatulate, broader and longer than the sepals. *Stamens* 2 in front of each petal, glabrous. *Ovary* short, crowned by 5 short slightly spreading styles, glabrous towards the apex. *Fruit* unknown. Kurz For. Flora Burma, II, 531; Clarke in Flor. Br. Ind. II, 597. *H. foetidum*, Benth. in Journ. Linn. Soc. IV, 37 (*in part*). *Blackwellia dasyantha*, Turcz. Bull. Soc. Imp. Mosc. Vol. XXXVI (1863), 610. *Blackwellia spec.*, Griff. Notulæ IV, 584.

KEDAH; *Curtis* 2506. TRANG; *King's Collector* 1393. DISTRIB. Tenasserim.

Kurz describes the calyx-lobes and petals as 6 each, and in that he is quite wrong; for dissection of Griffith's specimen (which is the type of the species) shows 10 of each. Although the structure of the flowers is the same in the gatherings of this plant from Burma, Kedah and Trang, there is considerable difference as to the amount of hair on the leaves and also as to their edges. The Burmese specimens are rather obscurely crenate except when very young; the Kedah plant has its adult leaves boldly crenate and minutely pubescent on the lower surface and glabrescent on the upper (except the midrib and main nerves); while the Trang specimens are glabrescent on both surfaces, with the exception of the nerves and midrib. The flowers of the Trang plant are moreover slightly larger than those either from Kedah or Tenasserim.

5. *HOMALIUM FRUTESCENS*, King. A tree 20–30 feet high; young branches slender, pale when dry, glabrous, striate. *Leaves* thinly coriaceous, elliptic-oblong to elliptic, shortly acuminate, tapering slightly to the base; main nerves 7 or 8 pairs, curving upwards, prominent beneath; both surfaces glabrous, minutely reticulate, the lower pale-brown and the upper olivaceous when dry; length 3–5 in., breadth 1.75–2.25 (rarely 2.75 in.), petiole .1 in. *Racemes* axillary, sometimes with 2 or 3 branches, about as long as the leaves or sometimes longer, the rachis puberulous; the flowers numerous but not crowded, in pairs or solitary, about .25 in. long, and .1 in. or .15 diam. at the mouth; the pedicel under .1 in. in length. *Calyx* narrowly cylindrical-conic, boldly ridged; teeth 6, lanceolate, acute, erect. *Petals* larger than the petals, oblong-lanceolate, pubescent on both surfaces but especially on the upper. *Stamens* 4 opposite each petal and slightly exceeding it in length, glabrous. *Ovary* hairy, elongate; styles 5, as long as the stamens, cylindrical, erect. *Fruit* unknown. *Blackwellia longiflora*, Miq. Flor. Ind. Bat. I, Pt. I, 715. *B. caryophyllacea*, Zoll. et Moritz. Syst. Verz. 33; Miq. Flor. Ind. Bat. I, c. 715; *Homalium caryophyllaceum*, Benth. in Journ. Linn. Soc. IV, 38. *Cordylanthus frutescens*, Blume Mus. Bot. Ludg. Bat. II, 27, fig. III. *Homalium cordylanthus*, Benth. in Journ. Linn. Soc. IV, 38.

SELANGOR; *Ridley* 1902. JOHORE; *Ridley* 4050, 4182. PERAK; *King's Collector*, 776, 777, 784, 5246, 7040, 10471, 10237, 10102, 10996.

The flower of this is excellently figured by Blume in his *Mus. Bot.* as quoted above. Flowers however of a slightly different shape are found in some specimens. In these the calyx-tube is funnel-shaped and less cylindrical, and the petals are more spreading. These are associated usually with larger leaves, more broadly elliptic in shape; and at one time I was of opinion that they might belong to a different species. But the examination of nearly a hundred specimens of the two forms as collected in Perak has convinced that they are not specifically separable. Blume describes the plant as a shrub, but in Perak it is always a small tree. Miquel's *Homalium obovale* from Sumatra (*Flor. Ind. Bat. Suppl.* 334) comes very near this, and perhaps is not distinct.

6. *HOMALIUM UNDULATUM*, n. spec. King. A tree 40–60 feet high; young branches slender, pale-brown, minutely lenticellate. *Leaves* thinly coriaceous, elliptic, shortly and bluntly acuminate, slightly narrowed and sometimes unequal at the base, the edges undulate-crenate; both surfaces glabrous and minutely reticulate when dry, the upper shining, the lower dull; length 3–4 in., breadth 1.75–2 in., petiole .2–.25 in. *Inflorescence* consisting of a terminal panicle twice as long as the leaves and of a few solitary racemes from the upper leaf-axils, many-flowered, the rachises covered by minute rather sparse pale tomentum. *Flowers* .6 or .7 in. in diam., lax; their pedicels slender, tomentose, .4 in. long. *Calyx-tube* widely funnel-shaped, very slightly ridged, minutely tomentose; teeth 5, lanceolate, tomentose on both surfaces like the tube. *Petals* 5, much longer than the sepals, obovoid, blunt, clawed at the base, reticulate, tomentose. *Stamens* shorter than the sepals and much shorter than the petals, 4 in front of each petal, glabrous. *Ovary* hairy, crowned by 3 narrowly conical spreading hairy styles. *Fruit* unknown.

PERAK; *King's Collector* 7064, 8184.

7. *HOMALIUM GRANDIFLORUM*, Benth. in *Journ. Linn. Soc.* IV, 37. A tree 30–40 feet high; young branches rather stout, glabrous. *Leaves* coriaceous, elliptic to oblong, acute or shortly acuminate, narrowed near the petiole, the edges revolute and obscurely crenulate; both surfaces minutely reticulate when dry, and the upper very shining, the lower somewhat duller; main nerves 9–12 pairs, ascending, only slightly curved; length 3.5–6.5 in., breadth 1.75–3.25 in.; petiole .2–.3 in., stout. *Inflorescence* consisting of terminal few-branched panicles and of solitary axillary racemes with tomentose rachises. *Flowers* numerous but not crowded, solitary, not in glomeruli, .75 in. in diam.; the pedicels .2 in. long, tomentose. *Calyx-tube* short, hemispheric; teeth 7–9, spatulate-oblong, spreading, enlarged often flowering. *Petals* lanceolate, shorter than the calyx-teeth; the glands alternating with the petals, large. *Stamens* 7–12 opposite each petal; the filaments subulate, sparsely pilose. *Ovary* free or nearly so, 6–7-ridged, tomentose, conical; styles

6 or 7, short, glabrous, erect. *Fruit* unknown. Clarke in Flor. Br. Ind. II, 598. *Pierrea dictyoneura*, Hance, in Trimen's Journ. Bot. for 1877, 339-

MALACCA; Griffith. PERAK; *Scortechini*. SINGAPORE; Ridley 6527. Gulf of Siam; Hance. **DISTRIB.** Tenasserim.

An examination of flowers of his *Pierrea dictyoneura*, sent to me by the late Dr. Hance, proves that that plant is a species of *Homalium* with larger flowers and more stamens than usual.

### Order LII. CUCURBITACEÆ.

Climbing herbs or shrubs; tendrils solitary, lateral, spiral, simple or divided. *Leaves* alternate, petioled, frequently cordate, simple, lobed or pedately divided. *Flowers* monœcious or dicecious, yellow or white, racemed and solitary, less commonly paniced. *Calyx-tube* wholly adnate to the ovary; limb rotate, campanulate, or tubular; lobes 5 (rarely 3), imbricate. *Petals* 5, inserted on the calyx-limb, united in a tube, or nearly or quite free, sometimes fimbriated at the margin, valvate or involute in the bud. *Stamens* inserted at the mouth or about the middle or at the base of the calyx-tube, usually 3 (sometimes 5 or 2), anthers free or united into a tube, one usually 1-celled and the other two 2-celled, cells straight or flexuose or conduplicate, the connective sometimes crested or produced. *Ovary* inferior, usually 3-carpellary; style 1 with 3 stigmas, more rarely styles 2-3-4; placentas usually 3, vertical, in double lines, the edges of the carpellary leaves being often turned in so far that the ovary (even before fertilization) is spuriously 3-celled; ovules usually many, horizontal, rarely pendulous, sometimes few and pendulous from near the top of the ovary. *Fruit* generally berried or fleshy, indehiscent or dehiscing by valves or by a circumscissile lid, often 1-celled, the seeds being often packed in pulp or fibre. *Seeds* usually many, often compressed, horizontal, pendulous, frequently corrugated or sub-spinose on the margins, albumen 0. **DISTRIB.** Species 600, in the warmer parts of the whole globe especially in the tropics.

**Tribe I. CUCUMERINÆ.** Ovules horizontal; female flowers solitary, never paniced; stamens 3, rarely 2 or 5, free or variously connate; cells of anthers straight, curved or flexuous; ovary bearing 3 (rarely 2 or 5) placentas:—

**Anther-cells** conduplicate or sigmoid; corolla rotate or campanulate, divided to the base:—

**Petals** cirriferous or fimbriate:—

- |                                   |     |     |                   |
|-----------------------------------|-----|-----|-------------------|
| Seeds only 6, perfect, very large | ... | ... | 1. HODGSONIA.     |
| Seeds numerous, testa not fibrous | ... | ... | 2. TRICHOSANTHES. |

**Petals** entire:—

- |   |     |     |                  |
|---|-----|-----|------------------|
| <b>Calyx-tube</b> of male flower elongate; the anthers included in the tube, cohering, sessile or subsessile, tendrils usually simple | ... | ... | 3. GYMNOPETALUM. |
|---|-----|-----|------------------|

Calyx-tube of male flower short; anthers usually exerted or sub-exserted, free or slightly coherent:—  
Stamens inserted near the mouth of the calyx-tube; the anthers cohering slightly:—

Male flowers in racemes or clusters; fruit more or less fibrous, dehiscing by a transverse lid near the apex; tendrils 2-5-fid ... 4. LUFFA.

Male and female flowers solitary; fruit not fibrous, very fleshy, indehiscent; tendrils 2-fid ... 5. BENINCASA.

Stamens inserted below the mouth of the calyx-tube; anthers more or less cohering; male flowers in racemes, usually bracteate; tendrils simple ... 6. MOMORDICA.

Anther-cells straight, the connective produced, the fruit on a slender pedicel ... 7. MELOTHRIA.

Tribe II. GYNOSTEMMEÆ. Ovules pendulous; female flowers in panicles; stamens 3-5, anther-cells straight, filaments connate near the base; ovary 3-celled and with 3 placentas, fruit indehiscent ... 8. GYNOSTEMMA.

Tribe III. ZANONÆÆ. Ovules pendulous, female flowers in panicles or racemes; stamens 5, free, anthers straight; ovary with 3 placentas; fruit cylindric or clavate, dry, 1-celled, dehiscence circumscissile; seeds winged:—

Calyx-lobes 3, seeds winged all round ... 9. ZANONIA.

Calyx-lobes 5, seeds winged at the apex only ... 10. ALSOMITRA.

### I. HODGSONIA, H. f. & T.

A large climber. *Leaves* coriaceous, 3-5-lobed, long-petioled; tendrils 2-3-fid. *Flowers* large, diœcious; males in long racemes; bracts oblong, entire, deciduous; females solitary. *Male-calyx* long-tubular, with a shortly campanulate mouth and 5 short teeth; petals 5, connate at the base, very long-fimbriate; stamens 3, filaments very short; anthers exerted, connate, linear, one 1-celled, two 2-celled, cells conduplicate. *Female* calyx and corolla as in the male; ovary globose, 1-celled; style long; stigmas 3, oblong, bifid, exerted; placentas 3, parietal, near the base of the ovary, 2-ovulate on each side. *Fruit* large, depressed-globular, 12-grooved, flesh hard; perfect seeds usually six, each having a smaller, commonly barren one, attached to its side, flat-ellipsoid, with sunk veins.

HODGSONIA HETEROCLITA, Hook. fil. and Thoms. in Proc. Linn. Soc. II, 257. *Stem* very long, often reaching 80 or 100 feet. *Leaves* palmate, somewhat cordate at the base; the lobes entire, rarely slightly denticulate, acute; both surfaces glabrous, minutely reticulate when dry, 6-10 in. long and as broad, the petioles 2 or 3 in. long. *Male racemes* about as long as the leaves; bracts solitary, oblong, acute, 5 in. long. *Calyx* rusty-tomentose externally, the tube 3 or 4 in. long, with a gland

on each tooth of the mouth. *Petals* sub-obcordate, retuse, about 2 in. long, covered with brown hairs and 3-nerved externally; the inner surface white, the margins fringed with very long spiral villous yellow threads. *Filaments* clavate, anthers forming an inverted cone; *pistil* 0. *Female* flowers often on a separate plant; their peduncles 1 or 2 in. long, occasionally in a raceme much shorter than those of the males; *stamens* 0. *Fruit* turbinate, 4–10 in. in diam., and less from base to apex, covered with short reddish-brown tomentum. *Seeds* 2–3 in. long, and 1.5–2.25 in. broad. Hook, fil. Ill. Himal. Pl. tt. 1, 2, 3; Flor. des Serres, t. 1262, 3; Clarke in Hook, fil. Flor. Br. Ind. II, 606. *Hodgsonia macrocarpa*, Cogn. in DC. Mon. Phan. III, 349. *Trichosanthes macrocarpa*, Bl. Bijdr. 935; Ser. in DC. Prodr. III, 315; Miq. Flor. Ind. Bat. I, Pt. II, 676. *T. hexasperma*, Bl. Bijdr. 935; DC. Prodr. III, 315; Hassk. Pl. Jav. Rar. 192; Miq. Fl. Ind. Bat. 1. c. 678. *T. heteroclita*, Roxb. Hort. Beng. 70; Fl. Ind. III, 705; Wall. Cat. 6684. *T. grandiflora*, Wall. Cat. 6685 (not of Blume).

PERAK; *Scortechini*, *Wray*, *King's Collector*. MALACCA; *Maingay*. PENANG; *Wallich*. *DISTRIB.* Sumatra, Java, Borneo, Burma, Assam, and the base of the Eastern Himalaya.

The earliest name of this species was Roxburgh's (*T. heteroclita*), published in the *Hortus Bengalensis* in 1814. Blume's name *T. macrocarpa* dates from 1826.

## 2. TRICHOSANTHES, Linn.

Scandent herbs. *Leaves* entire or 3–9-lobed, denticulate; tendrils usually 2–5-fid. *Flowers* dioecious or occasionally monoecious, white; male peduncles usually in axillary pairs, one 1-flowered caducous, the other racemose; bracts large or small or 0; female flower solitary. *Male-calyx* long-tubular; teeth 5, lanceolate, entire serrate or lacinate. *Corolla* 5-fid nearly to the base, lobes long-fimbriate; stamens 3; anthers almost included, connate (free in *T. dioica*), long-linear, one 1-celled, two 2-celled, cells conduplicate. *Female* calyx and corolla as in the male. *Ovary* inferior, at the base of the calyx-tube, 1-celled; style filiform, 3-or 6-fid at the apex; placentas 3, parietal; ovules very many, horizontal, half-pendulous. *Fruit* lanceolate or globose, smooth, acute or obtuse at the apex. *Seeds* many, horizontal, packed in pulp, compressed, ellipsoid, sometimes angular on the margin. *DISTRIB.* Species 38, in South-East Asia, extending through Malaya to North Australia, also through China to Japan.

Leaves, although often deeply lobed, always simple:—

Male inflorescence ebracteate ... .. 1. *T. cucumerina*.

Male inflorescence bracteate:—

Bracts linear-oblong or narrowly rhomboid, quite

entire: ... .. 2. ? *T. Hearnii*.

- Bracts small ovate-lanceolate, caudate-acuminate, obscurely dentate, leaves quite smooth and glabrous on both surfaces ... .. 3. *T. tricuspidata.*
- Bracts very large, ovate to sub-orbicular, deeply incised or simply serrate; calyx-teeth lanceolate; fruit usually globular, rarely ovate ... .. 4. *T. palmata.*
- Bracts rather large, oblong-ovate, lacinate; calyx-teeth spreading, entire; fruit always ellipsoid ... 5. *T. Wallichiana.*
- Leaves usually trifoliate, but sometimes simple on the same or different plants; leaflets membranous, unequal, much acuminate, the edges undulate-dentate: bracts of male inflorescence small, oblong, their edges with a few long distant teeth ... .. 6. *T. Wawraei.*
- Leaves always trifoliate; leaflets coriaceous, shortly and bluntly apiculate or subacute, the edges quite entire; bracts of male inflorescence deltoid, their edges pectinate 7. *T. celebica.*

1. *TRICHOSANTHES CUCUMERINA*, Linn. Sp. Pl. Ed. 1, 1008. *Stems* slender, angled, puberulous. *Leaves* membranous, orbicular-reniform to broadly ovate in general outline; the edges remotely denticulate, often more or less deeply 3-5 or 7-lobed; the lobes broad with acute but not acuminate apices and often sinuate margins, the base deeply cordate, the sinus often sub-rectangular; upper surface sparsely pubescent or sub-glabrous, the lower deciduously pubescent at first, ultimately sub-scabrid; length 2-4 in. and breadth about the same; petiole 1-2 in., pubescent; tendrils slender, sulcate, puberulous, 2-3-fid. *Male peduncles* rather longer than the leaves, pubescent, bearing a few flowers towards the apex, ebracteate. *Flowers* .5-1 in. in diam. at the mouth; the tube 2 or 3 times longer, cylindric, a solitary male flower sometimes from the same axil as the peduncle. *Female flower* on a peduncle .5 in. long, fruit 1-3 in. long, narrowly ovoid, the apex conical, red when ripe; seeds half ellipsoid, compressed, corrugated. Lour. Flor. Cochchin, 588; Ser. in DC. Prodr. III, 315; Roxb. Hort. Beng. 70; Roxb. Flor. Ind. III, 720; Wall. Cat. 6690 A, B, C, D, F; Blume Bijd. 933; Dalz. & Gibs. Bomb. Flor. 102; Miq. Flor. Ind. Bat. I, Pt. I, 676; Naud. in Ann. Sc. Nat. Ser. 4, XVIII, 191; Kurz in Journ. As. Soc. 1877, Pt. II, 98; W. & A. Prodr. 350; Miq. Flor. Ind. Bat. I, Pt. I, 676; Thwaites Enum. Pl. Ceyl. 126; Benth. Flor. Austral. III, 314; Clarke in Hook. fil. Flor. Br. Ind. II, 609; Cogn. in DC. Mon. Phan. III, 358. *T. laciniosa*, Klein in Herb. Rottler. *T. pilosa*, Wall. Cat. 6691. *Bryonia umbellata*, Wall. Cat. 6700 D. *Cucumis Missionis*, Wall. Cat. 6728.

PERAK; *King's Collector* 5622. DISTRIB. Malayan Archipelago; British India.

The Perak plant has larger flowers than any Indian specimen, and I refer it to *T. cucumerina* with some hesitation.

2. ? *TRICHOSANTHES* HEARNI, F. Mull. in Benth. Flor. Austral. III, 315. *Stem* slender, glabrous, sulcate. *Leaves* membranous, broadly ovate, the apex acute or acuminate, the base deeply and widely cordate; the edges rather remotely denticulate, sometimes remotely sinuate-lobed; the upper surface glabrous and shining, the lower densely and minutely pubescent, the nerves, subglabrous and stout; length 4–8 in., breadth 3·5–6 in., petiole 1–1·75 in. *Male peduncles* often in pairs, axillary, longer than the leaves, slender, puberulous, angled; floriferous in the upper half; bracts linear-oblong, entire, about ·25 in. long; several of the lower ones narrowly rhomboid, all pubescent, flowers under 1 in. in diam. at the mouth; calyx-tube cylindrical, the mouth narrowly infundibuliform, puberulous; the lobes of the mouth narrow, acute. *Female flower* and fruit unknown.

ANDAMANS; *Kurz, King's Collector.*

The late Mr. Kurz collected a single specimen of this on Rutland island (in the Andaman group) many years ago, and he referred it in the Calcutta Herbarium to *Trichosanthes reniformis*, Miq. He also suggested for it the name *Trichosanthes herpetospermum*,—a name which he never published. In 1890 several specimens of the plant were collected near Port Mowat, on the South Andaman. Specimens of this second gathering, as well as of Kurz's original gathering, were sent by me to Mr. C. B. Clarke who found that they closely resemble, and are probably identical with, *T. Hearnii*, an Australian species named by the late Baron von Müller, and of which an imperfect description was published by Mr. Bentham in his *Flora of Australia*. And to this species I now doubtfully refer both the Andaman gatherings.

3. *TRICHOSANTHES TRICUSPIDATA*, Lour, Flor. Cochinchin. II, 723. *Stem* stout, sulcate, smooth, glabrous. *Leaves* thinly coriaceous, ovate-sub-triangular, with from 3–5 stout triangular broad, acute or acuminate, spreading lobes, the base broadly cordate, the edges remotely and minutely denticulate or subentire, glabrous on both surfaces; length and breadth 3–5 in.; petiole slender, 1–1·5 in.; tendrils 3-fid. *Male peduncles* floriferous for half their length, longer than the leaves, stout, glabrous or puberulous, 10–20 flowered; bracts thick, rigid, ovate-lanceolate, caudate-acuminate, obscurely dentate or entire; calyx-tube tapering to the base, shortly but densely tomentose, the lobes caudate-lanceolate with a few irregular distant teeth; corolla 1·5 in. in diam. *Female flower* from the same axil as the male peduncle, the tube 1·5 in. long, the corolla ·75 in. in diam.; *fruit* ovoid when young, subglobular and 2 in. in diam. when ripe, smooth, yellow with numerous small black pustules, the pulp thick; the seeds in the very centre, broadly ovate, compressed, ·5 in. long and ·4 in. broad. Blume Bijdr. 935; Ser. in DC. Prodr. III, 315; Roem. Syn., fasc. II, 95; Miq. Flor. Ind. Bat. I, Pt. I, 676; Cogniaux in DC. Mon. Phan. III, 374.

PENANG; *Curtis* 1947. PERAK; *Scortechini* 376; *King's Collector* 2202, 5111; *Wray* 4029.



This resembles *T. palmata*, Roxb. and *T. Wallichiana*, Wight; but the lobes of the leaves are shallower and their surfaces more glabrous and not at all scabrid, while the bracts of the male inflorescence are much narrower and very acuminate; and their edges, instead of being laciniate, are entire or at most obscurely dentate.

4. *TRICHOSANTHES PALMATA*, Roxb. Hort. Beng. (1814) p. 70. *Stem* stout, angled and sulcate, glabrous. *Leaves* thickly membranous, broadly ovate or orbicular in general outline, deeply cut down to about the middle into 3-7 lobes; the lobes acute or acuminate, their edges entire or denticulate, the base deeply but usually narrowly cordate; upper surface more or less scabrous or scabrid, glabrous, glandular near the apex of the petiole, the lower glabrous or somewhat pubescent, length and breadth 2-6 in.; petiole rather slender, 1 to 3 in. long; tendrils 2- or 3-fid. *Male* racemes sometimes in pairs, longer than the leaves, few-flowered; bracts large, ovate to sub-orbicular, deeply incised or simply serrate, glabrous or with viscid hairs; calyx-tube 1.5 in. long, tomentose or glabrous, the teeth lanceolate, the edges deeply serrate or laciniate. *Female* flower solitary, on a peduncle less than 1 in. long; fruit ovoid, pointed when young, globular when ripe, 1.5-2 in. in diam. *T. palmata*, Roxb. Flor. Ind. III, 704; Wall. Cat. 6688 (excl. C, F); W. & A. Prodr. 350; Wight Ill. t. 104, 105; Dalz. & Gibs. Bomb. Flor. 103. *T. laciniosa*, Wall. Cat. 6689 A, B. *T. aspera*, Heyne in Herb. Rottler. *T. tricuspis*, Miq. Flor. Ind. Bat. I, Pt. I, 679. *T. cordata*, Wall. Cat. 6686 (excl. A and B). *T. anguina*, Wall. Cat. 6687 (F partly); Voigt Hort. Bot. Sub. 58. *T. bracteata*, Kurz in Journ. As. Soc. Beng. 1877, Pt. II, 99; Cogn. in DC. Mon. Phan. III, 375. *T. pubera*, Blume Bijdr. 936; Ser. in DC. Prodr. III, 315; Roem. Syn. fasc. II, 95; Miq. Flor. Ind. Bat. I, Pt. I, 675. *Cucurbita Melopepo*, Wall. Cat. 6725. *Involucraria Wallichii*, Seringe in DC. Prodr. III, 318. *Bryonia palmata*, Wall. Cat. 6711 F.

PERAK; Wray 2181, 2371, 2478, 3049; King's Collector 1848, 4983, 10579. ANDAMANS; King's Collector.

The fruit when ripe is usually globular; but there are specimens in the Calcutta Herbarium which have oval fruit like *T. Wallichiana*, Wight, and at the same time the scabrid leaves and laciniate calyx lobes which are supposed to be characteristic of this species.

5. *TRICHOSANTHES WALLICHIANA*, Wight in Ann. and Mag. Nat. Hist. VIII, 70. *Stem* robust, angled and sulcate, glabrous. *Leaves* membranous, sub-orbicular in general outline, divided half-way down or more into 3-5 oblong or triangular acute lobes; the lobes sparsely denticulate, the lower on each side sometimes lobulate, the base deeply and widely cordate; both surfaces glabrous and usually smooth, the upper sometimes slightly scabrid and with a few glands near the apex of the petiole; length and breadth 3-7 inches, tendrils 3-fid. *Male*

*peduncles* at first shorter than the leaves, elongating with age; bracts oblong-ovate, their edges lacinate; calyx-tube glabrous, the teeth spreading, entire; petals obovate, lacinate. *Female flower* solitary; fruit ellipsoid, obtuse, smooth, 2–4 in. long. Cogn. in DC. Mon. Phan. III, 368. *Involucraria Wallichiana*, Ser. in Mem. Hist. Nat. Geneve III, Pt. I, 25 t. 5; in DC. Prodr. III, 318; Roem. Syn. fasc. 2, p. 98. *Trichosanthes multiloba*, Clarke in Hook. fil. Flor. Br. Ind. II, 607 (not of Miq.). *T. grandibracteata*, Kurz in Journ. As. Soc. Beng. XLVI, 98, 99.

PAHANG; *Ridley* 244. SINGAPORE; *Ridley* 296, 446, 4762. PENANG; *Curtis* 2004. PERAK; *Scortechini* 508 and 600.

A species scarcely separable from *T. pubera*, Bl., of which in my opinion it would better be treated as a variety.

6. TRICHOSANTHES WAWRÆI, Cogn. in DC. Mon. Phan. III, 384. *Stem* slender, sub-glabrous, sulcate. *Leaves* membranous, trifoliolate or simple; leaflets of the trifoliolate form unequal, the middle one oblanceolate, the lateral ones angularly auriculate or lobulate at the base on the outer side, the edges of all subentire or sparsely denticulate and the apices much acuminate, all with slender petiolules .25–.3 in. long; the lower surface reticulate when dry, glabrous, the upper sparsely and minutely pustulate and glabrous; length of the leaflets 2.5–5 in., breadth .75–1.5 in., petiole 1.25–2 in.; the simple form triangular-oblong, tapering gradually to the apex, the base with 2 short sub-horizontal lobules, length 2.5–5 in.; tendrils short, simple or bifid. *Male peduncles* shorter than the leaves, very stout, sulcate, glabrous, many-flowered; bracts small, oblong, their edges with a few long teeth, the flowers extending for half their length; calyx .5 in. long, narrowly campanulate, suddenly contracted into the tube, the teeth erectopatent or recurved, lanceolate, acuminate, entire. *Female flower* with cylindric tube slightly dilated at the apex, the teeth as in the male; petals white, yellowish at the base, oblong, 3-nerved, the fimbriae long, the external surface minutely papillose; ovary, glabrous, ovoid-oblong; *fruit* subglobular when young, oblong when ripe, smooth, red with orange or white stripes; *seeds* compressed, oblong-ovoid, .6 in. long.

PERAK; *King's Collector* 2203, 4519, 4668, 5380, 5405, 10176. *Wray* 2382; *Scortechini*. (SINGAPORE; *Wawra* 241 in Herb. Vindob. *vide* Cogniaux.)

Cogniaux describes this as having its leaves always trifoliolate. But in some of the Perak specimens both trifoliolate and simple leaves as above described are to be found; in a few only simple leaves, and in the majority only trifoliolate.

7. TRICHOSANTHES CELEBICA, Cogn. in DC. Mon. Phan. III, 385. *Stem* slender, glabrous, sulcate, sometimes hairy at the nodes. *Leaves* coriaceous, trifoliolate; the leaflets unequal in size, the middle one

the largest, ovate-oblong, shortly acuminate or sub-acute; the base slightly narrowed, oblique, not cordate, the edges quite entire; both surfaces glabrous, minutely reticulate when dry, the upper minutely punctate; length of leaflets 3-4.5 in., breadth 1.5-2.5 in.; petiole 1-1.5 in. long, stout; petiolules .15 in.; tendrils short, bifid. *Male peduncle* shorter than or equal to the leaves, stout, deeply sulcate, adpressed-pubescent, floriferous for half its length; bracts deltoid, pectinate, tawny glandular-tomentose. *Calyx-tube* narrowly infundibuliform, minutely pubescent; the teeth lanceolate, acuminate, entire, erectopatient. *Female flower* unknown. *Fruit* ovate, smooth, 8 in. long and 3 or 4 in. in diam. with a leathery rind, bright red with 10 yellow stripes when ripe; *seeds* obliquely oblong, compressed, smooth, .6 in. long and .4 in. broad.

PERAK; *Wray* 2460; *Scortechini*; *King's Collector* 4033. SINGAPORE; *Ridley* 2051, 4592, 6783; *Hullett* 247. *DISTRIB.* Celebes, Beccari.

### 3. GYMNOPTALUM, Arn.

Twining herbs, tendrils usually simple or 2-fid. *Leaves* petioled, 5-angular, nearly entire or deeply lobed. *Flowers* white (or yellow?), somewhat large; occasionally monœcious; male peduncles in fully developed plants 2 from each axil, the earlier 1-flowered, the later longer with racemes, either often suppressed; bracts on the racemes persistent, large, lanceolate, incised or small; females 1-flowered, usually in separate axils. *Male calyx-tube* long, contracted near the mouth, limb of 5 lanceolate segments; petals 5, not fimbriate on the margin; stamens 3; anthers included, connate, elongate, 1-2-celled, cells conduplicate; rudiments of the ovary 1 or 3, small, linear. *Female calyx* and corolla as in the male; ovary oblong; style long, stigmas 3, short linear; ovules horizontal, many; placentas 3, long, vertical. *Fruit* ovate-oblong, acute at both ends. *Seeds* many or few, ellipsoid, compressed, margined, nearly smooth. *DISTRIB.* Species 6; in India, China and Malaya.

Leaves not lobed ... .. 1. *G. integrifolium*.

Leaves lobed:—

Leaves 3-5-lobed half way down, reniform to triangular in general outline; lobes triangular acute, not lobulate ... .. 2. *G. Cochinchinensis*.

Leaves deeply 5-lobed, the lobes lobulate-sinuate, blunt, their general outline orbicular ... .. 3. *G. quinqueloculare*.

1. GYMNOPTALUM INTEGRIFOLIUM, Kurz in Journ. As. Soc. Beng. XL, 58. Creeping, only a few feet long; *stem* scabrid, tendrils simple or bifid. *Leaves* reniform, obtuse; the margin undulate or denticulate, not lobed; upper surface very scabrid, the lower softly tomentose,

length 1·75–2 in., breadth ·8–2·25 in., petiole ·45–·65 in. *Flowers* monœcious, all solitary, axillary and bracteate, the *male* peduncle 1·5 in. long, the *female* only ·25 in. *Calyx-tube* in both sexes elongate, densely covered with long brown hairs; the teeth 5, lanceolate; *corolla* white, about 1·35 in. in diam., its lobes obovate, entire, pubescent, veined. *Fruit* about ·75 in. in diam., globular, smooth, orange-red. Kurz in *Flora* for 1871, p. 295; Clarke in *Hook. fil. Flor. Br. Ind.* II, 612. *Cucumis integri folius*, Roxb. *Flor. Ind.* III, 724; Wall. *Cat.* 6730. *Trichosanthes officinalis*, Wall. *Cat.* 6694. *T. integrifolia*, Kurz in *Journ. As. Soc. Beng.* XLVI, Pt. II, 99; Cogn. in *DC. Mon. Phan.* III, 386.

PERAK; Wray 2167; Ridley 3107.

Kurz named this *Gymnopetalium integrifolium* in the *Journal of the Asiatic Society of Bengal* which was issued in March 1871. His publication of it in *Flora* dates only from October of the same year.

2. GYMNOPETALUM COCHINCHINENSIS, Kurz in *Journ. As. Soc. Beng.* XLVI, Pt. II, 57. *Stems* slender, angled, slightly scabrid-hairy. *Leaves* reniform to triangular in outline, 5-angled or 3-5-lobed half way down; the lobes triangular, acute, the edges crenate-dentate and thickened, the base deeply and widely cordate, both surfaces more or less scabrid, length 2 to 4 in., breadth 2 to 3·5 in.; petiole scabrid-pubescent, 1–1·5 in. long; tendrils simple or bifid. *Male peduncle* longer than the leaves, the flowers racemose, or sometimes solitary; bracts large, incised-serrate, ·5–·75 in. long; calyx-tube sub-cylindric, villous, the mouth closed by deflexed hairs, the teeth erecto-patent; petals ovate-oblong, ·5 in. long, entire or sub-crenate. Peduncle of *female flower* shorter than the leaf-petiole, sparsely puberulous; *fruit* about 2 in. long. and ·75 in. in diam., somewhat scabrid, 10-ribbed, orange-red, the beak long; *seeds* about ·25 in. long. Kurz in *Flora* for 1871, p. 295; Clarke in *Hook. fil. Flor. Br. Ind.* II, 611; Cogn. in *DC. Mon. Phan.* III, 391. *Bryonia cochinchinensis*, Lour. *Flor. Cochinch.* 595; *DC. Prodr.* III, 305. *Momordica tubiflora*, Roxb. *Flor. Ind.* III, 711, (not of Wallich). *Tripodanthera cochinchinensis* Roem. *Synops.* II, 48. *Scotanthus tubiflorus*, Naud. in *Ann. Sc. Nat. Ser.* 4, XVI. 172, t. 3. *Trichosanthes cucumerina*, Wall. *Cat.* 6690 E. *T. ? Fatoa*, Ham. in Wall. *Cat.* 6695. *Bryonia grandis*, Wall. *Cat.* 6700. K. L. *Trichosanthes costata*, Bl. *Bijdr.* 933; *Ser. in DC. Prodr.* III, 314.

PAHANG; Ridley 2446. KEDAH; Curtis 2592. PERAK; King's *Collector* 10563. *DISTRIB.* British India, Malayan Archipelago, China.

3. GYMNOPETALUM QUINQUELOBUM, Miq. in *Flor. Ind. Bat.* I, Pt. I, 681. A slender annual; *stem* striate, with short pubescence or glabrous. *Leaves* orbicular in general outline, deeply 5-lobed; the lobes sinuately 2- or 3-lobulate, or oblong and subentire; both surfaces sparsely covered with thick whitish hairs with bulbous bases, length

1·5-2·25 in., breadth 1·75-3 in.; petiole ·75-1 in., sparsely pubescent. *Male flowers* usually solitary, rarely in racemes slightly longer than the leaves, shortly pilose; the bracts oblong, serrate, ·5 in. long. *Calyx-teeth* erect, entire or dentate; petals oblong, acute, puberulous outside. Peduncle of *female flower* ·5-1 in. long. *Fruit* brilliant scarlet when ripe, oblong-fusiform, acutely ribbed, shortly pubescent, 1·5-2 in. long; *seeds* blackish, rugulose, obscurely marginate, narrowed to the base, ·2 in. long and about ·1 in. broad. Clarke in Hook. fil. Flor. Brit. Ind. II, 611; Cogn. in DC. Mon. Phan. III, 392. *Scotanthus Porteanus*, Naud. in Ann. Sc. Nat. Ser. V, Vol. 5, 25. *Gymnopetalum heterophyllum*, Kurz in Trim. Journ. Bot. for 1875, p. 326.

ANDAMAN AND NICOBAR ISLANDS; Kurz.

#### 4. LUFFA, Cav.

Climbers, large or small, pubescent or nearly glabrous; tendrils 2-5-fid. *Leaves* cordate, usually 5-angular or 5-lobed; petiole without glands at its apex. *Flowers* yellow or white, monœcious, males and females often from the same axil; females solitary or paniced, males on long or short racemes or clustered. MALE; calyx-tube turbinate, lobes 5, triangular or lanceolate; petals 5, obovate; stamens 3, rarely 5, filaments 3, free or connate; anthers exerted, free, one 1-celled, the others 2-celled; cells sigmoid, often on the margin of the broad connective. FEMALE; calyx-tube shortly produced above the ovary; lobes and corolla as in the male; ovary oblong, style cylindric, stigma 3-lobed; ovules very many, horizontal. *Fruit* large or small, oblong (not spherical), smooth or angular or spinous, ultimately fibrous, not succulent, 3-celled, usually circumscissile near the apex. *Seeds* many, oblong, compressed. **DISTRIB.** Species 6, in the warmer regions of the Old World and one in America.

LUFFA ÆGYPTIACA, Miller Gard. Dict. ed. VIII, ex Hook. fil. in Oliv. Flor. Trop. Afr. II, 530. *Stem* stout, many yards in length; the young branches glabrous, angled and very deeply sulcate; tendrils 2-3-fid. *Leaves* large, reniform or reniform-orbicular in general outline, palmately 5-lobed; the lobes acute, lobulate and denticulate; both surfaces scabrous or scaberulous, punctate, glabrous except the pubescent nerves on the lower surface; length 2·5-6 in., breadth 3-9 in., petiole 2-2·5 in., pubescent, eglandular. *Male peduncle* 6 in. long; the flowers 4-12, crowded near the summit, 1·5-2 in. in diam., their pedicels short, each with a small ovate viscid bract, or ebracteate; petals 5, yellow with green veins; stamens 5. *Female flower* solitary on a peduncle 1-3 in. long, usually from the same axil as the male inflorescence; fruit 5-12 in. long, sub-cylindric, with numerous bold ridges; *seeds* usually black,

narrowly winged, smooth or slightly tubercled. DC. Prodr. III, 303; Clarke in Hook. fil. Flor. Brit. Ind. II, 614. *Cucumis aegyptiacus*, Vesl. in Alp. Pl. Aegypt. p. 199, t. 58, 59. *Momordica Luffa*, Linn. Spec. ed. 1, 1009. *L. pentandra*, Roxb. Flor. Ind. III, 712; W. & A. Prodr. 343; Wall. Cat. 6751; Wight Ic. t. 499. *L. racemosa*, Roxb. l. c. 715. *L. clavata*, Roxb. Hort. Beng. 104; Flor. Ind. III, 714. *L. acutangula*, W. & A. l. c., (not of Roxb.). *L. cylindrica*, Roem. Synops. II, 63; Naud. in Ann. Sc. Nat. Ser. 4, XII, p. 119; Kurz in Journ. As. Soc. 1877, Pt. II, 100; Cogn. in DC. Mon. Phan. III, 456. *L. Petola* and *L. Cattu-picinna*, Seringe in DC. l. c. *L. Parvala*, Wall. Cat. 6758. *L. Gosa*, *hederacea* and *Satpatia*, Wall. Cat. 6753, 6755, 6757. *Bryonia cheirophylla*, Wall. Cat. 6715 A.

PERAK; King's Collector 1020. DISTRIB. British India and in the Tropics generally; often cultivated.

The synonymy of this species occupies more than a page in Cogniaux's excellent Monograph of the *Cucurbitaceæ* in De Candolle's *Suites au Prodromus*, Vol. III. I have followed Messrs. Cogniaux and C. B. Clarke in reducing here Roxburgh's three species *L. pentandra*, *L. racemosa* and *L. clavata*, but I do so with considerable hesitation. Neither in flower nor leaf do Roxburgh's figures of his *L. clavata* and *L. pentandra* much resemble each other, whatever relation either of them may bear to *M. Aegyptiaca*, Miller. The material of the Indian species in the Calcutta Herbarium is very unsatisfactory, and I do not think the last word on them will be said until they have been carefully cultivated side by side, and studied as they grow.

##### 5. BENINCASA, Savi.

A large climber, softly hairy, tendrils 2- or 3-fid, rarely simple; *Leaves* cordate, reniform-orbicular, more or less 5-lobed; petiole without glands. *Flowers* large, yellow, monœcious, all solitary, without bracts. MALE; calyx-tube campanulate; lobes 5, leaf-like, serrate; petals 5, nearly separate, obovate; stamens 3, inserted near the mouth of the tube; anthers exerted, free, one 1-celled, two 2-celled, cells sigmoid. FEMALE; calyx and corolla as in the male; ovary oblong, densely hairy; style thick, with 3 flexuose stigmas; ovules numerous, horizontal; placentas 3. *Fruit* large, fleshy, oblong, pubescent, indehiscent. *Seeds* many, oblong, compressed, margined.

BENINCASA HISPIDA, Cogn. in DC. Mon. Phan. III, 513. Annual. *Leaves* on long petioles, reniform-rotund, with 5-9 small lobes, all toothed, 4-6 in. long and about the same in breadth; petioles cylindric, longer than the leaves, tendrils usually 3-fid. *Male flowers* axillary, solitary, peduncled, yellow, 1.5 in. in diam.; teeth of the calyx obtusely pinnatifid or undulate. *Female flowers* like the male, axillary, solitary, peduncled; calyx as in the male. *Fruit* sub-cylindric, obtuse at the ends, smooth, hairy when young but glabrous and with a whitish

bloom when ripe, 12–18 in. long and from 8–10 in. in diam. *Seeds* white with tumid margins, .5 in. long and .15 in. broad. *Cucurbita hispida*, Thunb. Flor. Jap. (1784), p. 322; Bl. Bijdr. 931; Wall. Cat. 6723. *C. Pepo*, Lour. Flor. Coch.-Chin. p. 593; Roxb. Flor. Ind. III, 718 (not of Linn.). *Benincasa cerifera*, Savi in Bibl. Ital. IX, 159; DC. Prodr. III, 303; W. et Arn. Prodr. 344; Miq. Flor. Ind. Bat. I, Pt. I, 665; Clarke in Hook. fil. Flor. Br. Ind. II, 616. *Cucurbita villosa*, Bl. Bijdr. 931; DC. Prodr. III, 317. *C. farinosa*, Bl. Bijdr. 931. *Cucurbita alba*, Roxb. in E. Ind. Comp. Mus., tab. 457 (ex W. et Arn.). *Gymnopetalum septemlobum*, Miq. Flor. Ind. Bat. I, Pt. I, 679. *Lagenaria dasystemon*, Franch. et Sav. Enum. Pl. Jap. I, 173.

NICOBAR AND ANDAMAN ISLANDS; cultivated, *King's Collectors*. DISTRIBUTION.—Malayan Archipelago, Australasia, China, Philippines, British India; cultivated.

### 6. MOMORDICA, Linn.

Climbing by simple tendrils. *Leaves* cordate, petioled, undivided in the Indian species. *Flowers* yellow or white, monœcious or diœcious, females solitary, peduncled; males solitary or racemed, bracteate or not. MALE; calyx-tube short, campanulate with 2–3 basal oblong incurved scales (ex Hook. f.) lobes 5; *corolla* 5-partite nearly to the base; stamens 3; filaments short; anthers at length free, one 1-celled, one or two 2-celled, cells conduplicate or horse-shoe-shaped. FEMALE; calyx and corolla as in the male; ovary oblong; style long, stigmas 3; ovules very many; placentas 3, horizontal. *Fruit* oblong or spherical, rough or smooth, indehiscent or 3-valved, many- or few-seeded. *Seeds* obovate or complanate, smooth, corrugate or sculptured. DISTRIBUTION.—Species 25, chiefly in the warmer parts of Africa, several in Tropical Asia, a few in Tropical America.

Leaves entire:—

- |   |     |     |     |                                |
|---|-----|-----|-----|--------------------------------|
| Male pedicels ebracteate                                  | ... | ... | ... | 1. <i>M. Clarkeana</i> .       |
| Male pedicels with a bract close to the flower            | ... | ... | ... | 2. <i>M. subangulata</i> .     |
| Leaves 3-lobed, the lobules entire                        | ... | ... | ... | 3. <i>M. Cochinchinensis</i> . |
| Leaves 5-7-lobed, the lobules sinuate-dentate or lobulate | ... | ... | ... | 4. <i>M. Charantia</i> .       |

1. MOMORDICA CLARKEANA, n. spec. King. *Stem* slender, 4-angled, glabrous, 20–30 feet long. *Leaves* thinly membranous, broadly ovate, never lobed, acute, the base deeply cordate or emarginate, both surfaces quite glabrous; length 3–5 in., breadth 3–4 in.; petiole 1.5–2 in., slender, eglandular. *Male flowers* .75 in. in diam., on filiform pedicels several form a leaf-axil, or in few-flowered lax racemes; calyx-lobes puberulous, broad, obtuse, their margins membranous and glabrous; *corolla* deeply divided into 5 broad blunt lobes, puberulous. *Female flower* unknown.

*Fruit* vermilion when ripe, sub-globular, apiculate when young, glabrous; without ridges or papillæ, 2-2.5 in. in diam.; *seeds* as in *M. Cochinchinensis*.

PERAK; *Scortechini* 1605; *King's Collector* 8340; *Wray* 3273.

This species is allied to *M. Cochinchinensis* and has seeds exactly alike those of that species. But the leaves of this are of thinner texture than those of *M. Cochinchinensis*, and they are not lobed; moreover the petiole in this is eglandular, and the fruit is quite free from ridges or papillæ of any kind. I have named it in honour of my friend Mr. C. B. Clarke who believes with me that it is a hitherto undescribed species.

2. *MOMORDICA SUBANGULATA*, Blume Bijdr. 928. *Stem* slender, glabrous, angled, sulcate, several feet long; tendrils single. *Leaves* broadly ovate, deeply cordate at the base, the apex acute, the edges with remote cartilaginous teeth; upper surface glabrous, the lower with sparse small adpressed hairs; length 1.75-2.25 in., breadth 1.25-1.65 in.; petiole 1 in. long, glabrous, eglandular. *Male peduncle* .5-1 in. long, pubescent; the bract close to the flower broader than long, its apex obtuse, its base cordate, minutely pubescent, the veins prominent; flower nearly 1 in. in diam.; calyx deep purple; its lobes oblong, obtuse, glandular, nearly .2 in. long; corolla yellow, partite to the base, the segments oblong. *Female flower* unknown; *fruit* ellipsoid, 2-3 in. long, obscurely ribbed, the ribs broken into joints. Ser. in DC. Prodr. III, 316; Roem. Syn. fasc. 2, p. 58; Miq. in Flor. Ind. Bat. I, Pt. I, 664; Kurz in Journ. As. Soc. Beng. XLVI, Pt. II, 102; Cogn. in DC. Mon. Phan. III, 443.

PERAK; *Scortechini* 399. DISTRIB. Java, Brit. India.

3. *MOMORDICA COCHIN-CHINENSIS*, Spreng. Syst. Veg. III, 14. A powerful climber ascending tall trees; *stem* angled, glabrous. *Leaves* in general outline sub-orbicular or broadly ovate, the base cordate or emarginate, usually 3-lobed to the middle or below it (sometimes 5-lobed), the margins with sparse umbilicate glands, both surfaces glabrous, length 4-7 in., breadth nearly the same; petiole 2-3 in. long, glandular at the middle and upper part; tendrils long, stout, simple. *Male peduncle* 2-6 in. long with an orbicular-reniform cucullate bract at its apex embracing the flower-bud; calyx-segments dark, coriaceous, hairy; corolla 1.75-3 in. across, white tinged with yellowish, some of the petals with black spots at the base, others with yellow glands. *Female peduncle* 1-2 in. long, (longer in fruit), with a small bract about the middle. *Fruit* ovate, pointed at the apex, fleshy, bright red and covered with conical points but not ribbed; 4-5 in. long; seeds numerous, blackish, ovate, compressed, sculptured, the margins undulate-sub-lobulate. Kurz in Journ. As. Soc. Beng. XLVI, Pt. 2, 102; Clarke in Hook. fil. Flor. Br. Ind. II, 618; Cogn. in DC. Mon. Phan. III, 444.



*M. mixta*, Roxb. Hort. Beng. 70; Flor. Ind. III, 709; Wight & Arn. Prodr. 349; Roem. Syn., fasc. 2, 59; Hook. in Bot. Mag. t. 5145; Miq. Flor. Ind. Bat. I, Pt. 1, 664; Naud. in Ann. Sc. Nat. Ser. 4, XII, 132. *M. dioica*, Wall. Cat. (not of Roxb.) 6750, A to F. *Muricia Cochinchinensis*, Lour. Flor. Coch.-Chin. 733; Ser. in DC. Prodr. III, 318.

PERAK; *Scortechini*, King's Collector, Wray; a common plant.

DISTRIB.—British India, Malaya, Philippines.

4. MOMORDICA CHARANTIA, Linn. Sp. Pl. ed. I, p. 1009. *Stem* slender, branching, striate, pubescent, sometimes tomentose towards the apex, 3-6 feet long. *Leaves* reniform-orbicular in general outline, 1-3 in. in diam., deeply divided into 5-7 lobes; the lobes sinuate-dentate or lobulate and mucronate, constricted at the base, glabrous or slightly pubescent; petiole 1-3 in.; the tendrils simple. *Male peduncle* slender, with a reniform or orbicular bract at or below the middle. *Male flower* .35-.75 in. in diam.; the calyx-lobes ovate, acute; *corolla* somewhat irregular, yellow, its segments obtuse or emarginate, anther cells much bent. *Female peduncle* 2-4 in. long, slender, bracteate near the base; ovary fusiform, muricate. *Fruit* 1-3 in. long, ovoid, tapering to both ends, many-ribbed and bearing numerous triangular tubercles. *Seeds* compressed, sometimes almost 3-toothed, the margins corrugated, the sides sculptured. Lour. Flor. Cochchin. II, p. 598; Bot. Mag. t. 2455; Ser. in DC. Prodr. III, 311; Roxb. Flor. Ind. III, 707; Wight and Arn. Prodr. 348; Torr. and Gray Flor. N. Amer. I, 543; Wight Ic. tab. 504; Wight Ill. t. 105 *bis*; Miq. Flor. Ind. Bat. I, Pt. I, 663; Cogn. in Mart. Flor. Bras., fasc. 78, p. 14; Clarke in Hook. fil. Flor. Br. Ind. II, 616. Cogn. in DC. Mon. Phan. III, 436. *M. muricata*, Willd. Spec. IV, 602; Roxb. Flor. Ind. III, 707; W. & A. Prodr. 348; Miq. Flor. Ind. Bat. I, Pt. I, 663. *M. humilis*, Wall. Cat. 6747. *M. anthelmintica*, Schum. et Thou. Flor. Guin. 423. *M. Roxburghiana*, Don Gen. Syst. Gard. III, 35. *M. macropetala*, Mart. in Hook. Journ. Bot. V, 504.

PERAK; *Scortechini*. DISTRIB. Malayan Archipelago, British India, China, Tropical Africa and America.

#### 7. MELOTHRIA, Linn.

Climbing herbs; tendrils simple or 2-fid. *Leaves* petioled, deltoid, truncate or hastate, entire or deeply 3-lobed, little hairy, often punctate. *Flowers* small, white, usually monœcious, males and females often from the same axil; male pedicels long, clustered (rarely sub-solitary) in the axils, or clustered on long racemes resembling branches without leaves; female long-pedicelled. *Male*; calyx-tube short, teeth 5, small; corolla 5-partite; stamens 3, inserted in the middle of the calyx-tube; anthers free, one 1-celled, two 2-celled; cells free, straight, simple, more or less

lateral; connective prolonged, undivided, glabrous. *Female* calyx and corolla as in the male; ovary oblong, style long; stigmas 3, subglobose; ovules many, horizontal; placentas 3, vertical. *Fruit* indehiscent, globose, acute or fusiform, subrostrate. *Seeds* many, small, oblong, much compressed, obscurely margined, smooth or very nearly so. DISTRIBUTION. Species about 55, all tropical.

Fruit not beaked :—

Fruit globular, glabrous ... .. 1. *M. affinis*.

Fruit oblong, glabrous ... .. 2. *M. indica*.

Fruit beaked :—

Fruit fusiform, beaked, velvety ... .. 3. *M. marginata*.

1. MELOTHRIA AFFINIS, n. spec. King. Scandent; the stem slender, glabrous, 4-angled and deeply sulcate, not rooting at the nodes; the tendrils rather stout, bifid. *Leaves* ovate-cordate to triangular, often 3-5-lobed, the edges denticulate; upper surface densely scabrid-hispid, the hairs white; the lower paler and with hairs of the same colour but sparser and more slender; length 1.35-4.25 in., breadth 1.5-3.25 in., petiole .5-1 in. *Male* and *female* flowers often from the same axil; the *males* in many-flowered umbels on pedicels twice as long as the leaf-petioles, pubescent below, glabrous above; pedicels about 20, slender, unequal, dilated at the apex, glabrous, .25-.35 in. long. *Flowers* .1 in. in diam., globose, pubescent, with 5 slender short diverging subulate teeth below the mouth. *Petals* not seen; *anthers* 3, straight, the connective not produced. Pedicel of the *fruit* shorter and stouter than the peduncle of the male umbel, glabrous. *Fruit* globose, glabrous, thin-walled, many-seeded, red when ripe, .4-.5 in. in diam.; *seeds* obovoid, pitted, somewhat compressed, pale.

PERAK; *Scortechini* 495; *Wray* 860, 1404; *Curtis*; *King's Collector* 1069, 2539. BORNEO; BANGERMASSING; *Motley* 167.

Mr. C. B. Clarke, who was so good as to examine my specimens of this species and to compare them for me at Kew, assures me that the Perak specimens agree exactly with *Motley's* 167. Mr. Clarke considers the species as closely allied to *M. marginata*, Cogn. from which it differs by its globular glabrous fruit.

2. MELOTHRIA INDICA, Lour. Flor. Coch. China, 35. *Stem* slender, filiform, glabrous, 3-6 feet long, often rooting at the nodes, the tendrils simple. *Leaves* triangular-cordate, acute, entire or 3-lobed (sometimes deeply); the nerves somewhat hairy, otherwise glabrous, the lobes irregularly denticulate or lobulate; length 1.25-2 in. and breadth the same, petiole .6-1 in. *Male pedicels* solitary or in racemes of 2 or 3 on peduncles 1 in. long; calyx-tube broadly campanulate, its teeth subulate, spreading; *corolla* white, puberulous, its segments ovate-oblong. *Stamens* with thick obconic filaments, glabrous or sparsely villose; *anthers* ovate-oblong, ciliate, the connective much produced. *Peduncle*

of female flower solitary, longer than the leaf-petiole. *Fruit* oblong, glabrous, white, .5–.75 in. long. *Seeds* ovate, attenuate at the base. Ser. in DC. Prodr. III, 313; Naud. in Ann. Sc. Nat., Ser. 4, XVI, 169 t. 2; Hance Suppl. Hongkong Flora, 104; Kurz in Journ. As. Soc. Beng. XLVI, Pt. II, 105; Clarke in Hook. fil. Flor. Br. Ind. II, 626. *Bryonia geminata*, Blume Bijdr. 924; Ser. in DC. Prodr. III, 305; Roem. Syn., fasc. II, 35; Miq. Flor. Ind. Bat. I, Pt. I, 659. *B. tenella*, Roxb. Flor. Ind. III, 725. *Aechmandra indica*, Arn. in Hook. Journ. Bot. III, 274; Wight in Ann. and Mag. Nat. Hist. VIII, 267; Miq. Flor. Ind. Bat. I, Pt. I, 658.

SELANGORE; *King's Collector* 360. DISTRIB. British India, Cochin-China, Philippines, Hongkong.

3. *MELOTHRIA MARGINATA*, Cogn. in DC. Mon. Phan. III, 593. *Stem* creeping, rooting at the nodes, angular, sulcate, glabrous; the tendrils slender, simple, puberulous. *Leaves* ovate-cordate or more or less 3-lobed, acute; the edges minutely and distantly denticulate; the upper surface coarsely and distinctly and the lower minutely and more closely strigose, the nerves on both pubescent; length 1–1.25 in., breadth 1–1.75 in.; petiole .75–1.5 in., tomentose. *Male flowers* umbellate on a filiform few-flowered peduncle shorter than the petiole, glabrous; the pedicels erect, .2–.3 in. long; the calyx broadly campanulate, pubescent, its teeth subulate. *Petals* villose, yellow; anthers glabrous, inappendiculate. *Female flower* solitary on a peduncle .5 in. long. *Fruit* narrowly cylindrical, beaked, tapering to the base, velvety, .75 in. long, its peduncle filiform; *seeds* 6–8, foveolate. *Bryonia marginata*, Blume Bijdr. 924; Ser. in DC. Prodr. III, 305; Roem. Syn., fasc. II, p. 36; Miq. Flor. Ind. Bat. I, Pt. II, 660. *B. epigæa*, Blume Bijdr. 924; Ser. in DC. Prodr. III, 306. *Aechmandra Blumeana*, Roem. Syn. fasc. II, p. 33; Miq. Flor. Ind. Bat. I, Pt. II, 657. *Melothria Rumphiana*, Scheff. Ann. Jard. Bot. Buitenz. I, 25. *Cerasiocarpum? Maingayi*, Clarke in Hook. fil. Flor. Br. Ind. III, 629.

MALACCA; *Maingay* (Kew Distrib.) 1268. PERAK; *King's Collector* 874. DISTRIB. Java and Sumatra.

VAR. *heterophylla*, Cogn. in DC. Mon. Phan. III, 594. *Leaves* quite entire, ovate-cordate or oblong-sub-hastate, scabrous above, almost smooth beneath but hairy on the nerves. *Bryonia heterophylla*, Blume Bijdr. 925; Wall. Cat. 6704; Roem. Syn., fasc. II, 35. *B. Blumei*, Ser. in DC. Prodr. III, 305; Miq. Flor. Ind. Bat. I, Pt. I, 659. *Cerasiocarpum? penangense*, Clarke in Hook. fil. Flor. Br. Ind. III, 629.

PENANG; *Wallich*; *Curtis* 1928. DISTRIB. Java.

#### NOTE.

There are in the Calcutta Herbarium specimens of several species of *Melothria*

which Mr. C. B. Clarke, (who elaborated the family of *Cucurbitaceæ* for Hooker's Flora of British India, and who kindly compared my Malayan material in the Kew Herbarium) considers as probably new. But, as these want either flowers or fruit, I am obliged to leave them undescribed. The chief amongst these are Perak, Wray 2228 and 3416; and Andamans, King's Collector 2200.

### 8. GYNOSTEMMA, Blume.

Climbing herbs, tendrils simple. *Leaves* pedate; leaflets 3-5, ovate-lanceolate, serrate, membranous. *Flowers* small, dicecious, in axillary diffuse panicles, greenish. *Male flower*; calyx short, with 5 small lobes; corolla rotate, 5-partite, with lanceolate segments; stamens 5, filaments connate below; anthers 2-celled, the cells straight and elongate. *Female flower*, calyx and corolla as in the male; ovary rotund, 2-3-celled; styles 2 or 3, united below, bifid at the apex; ovules 2 in each cell, pendulous. *Fruit* globose, umbonate, indehiscent, as large as a pea, 1-3-seeded. *Seeds* wingless, verrucose, sub-muricate. Species 4; all Indo-Malayan.

GYNOSTEMMA PEDATA, Blume Bijdr. 23. Slender, 10-20 feet long; young branches and leaves puberulous or glabrous, rarely pubescent. *Leaves* membranous, trifoliolate or pedate, the petioles 1-1.5 in. long; leaflets 3-7, ovate-oblong, lanceolate or oblanceolate, unequal, the middle the longest, their apices acute or sub-acute, the bases narrowed and sometimes oblique, the edges crenulate or crenate-dentate; length .75-2.5 in., breadth .4-1 in., the petiolules .1-2 in. *Panicles* longer than the leaves, 3-6 in. or even a foot long, slender, sparsely branched, more or less coarsely pubescent. *Calyx-segments* triangular, acute; segments of *corolla* 1-nerved, ciliate-dentate. *Fruit* .15 in. in diam. *Seeds* trigonous. Roem. Syn., fasc. II, p. 110; Miq. Flor. Ind. Bat. I, Pt. I, 683; Clarke in Hook. fil. Flor. Br. Ind. II, 633; Cogn. in DC. Mon. Phan. III, 913. *G. laxa*, Cogn. Mon. Phan. III, 914; *Zanonia laxa*, Wall. Cat. 3727; Pl. As. Rar. II, 29; Arn. in Hook. Journ. Bot. III, 272 (*in note*). *Zanonia cissoides*, Wall. Cat. 3726; Pl. As. Rar. II, 28. *L. Wightiana*, Arn. Pugill. 38; Nov. Act. Acad. Nat. Cur. 18, Pt. I, 356; Roem. Syn., fasc. II, 117. *Alsomitra laxa*, Roem. Syn., fasc. II, 118. *Pestolozzia laxa*, Thw. Enum. Pl. Zeyl. 124. *P. pedata*, Zoll. et Moritz. Syst. Verz. p. 31. *Alsomitra cissoides*, Roem. Syn., fasc. II, 118. *Enkylia trigyna*, Griff. Pl. Cantor. 27; Miq. Prol. Flor. Jap., pp. 15 and 142. *E. digyna*, Griff. Pl. Cantor. 27. *Zanonia pedata*, Miq. Flor. Ind. Bat. I, Pt. I, 683. *Gynostemma cissoides*, Franch. et Sav. Enum. Pl. Jap. I, 176. *Vitis atroviridis*, Wall. Cat. 6040; *Vitis trichophora*, Wall. Cat. 9032.

PERAK; King's Collector 2306. DISTRIB. Malayan Archipelago, British India and Tonkin.

This plant varies as to the number of its leaflets in its leaves and as to pubescence. The pedate forms with 5-7-puberulous leaflets have been by some authors (among whom is M. Cogniaux, the latest monographer of the *Cucurbitaceæ*) considered as belonging to a different species from the plants with trifoliolate glabrous shining leaves; and the latter has been named *G. laxa*. After carefully examining about a hundred specimens collected in different parts of British India and Malaya, I find so many that unite to some extent the characters relied upon as distinctive that I have been driven, with all respect to M. Cogniaux, to adopt Mr. Clarke's view that there is but a single species.

### 9. ZANONIA, Linn.

Climbing herbs; tendrils simple. *Leaves* long-petioled, simple, ovate or oblong. *Flowers* small, dicecious, in large compound pendulous racemes, males pedicelled, females subsessile. *Male*; sepals 3, oblong or orbicular, concave; corolla rotate, 5-partite, the segments subacute; stamens 5, free, inserted on a fleshy disc, filaments very short; anthers 1-celled, transversely oblong. *Female*; calyx and corolla as in the male; ovary sub-clavate, at first 3-celled; styles 3, spreading, 2-fid at the apex; ovules in each cell 2 or many, pendulous, attached in 2 series to a fleshy parietal placenta. *Capsule* large, elongate-cylindric, clavate, 3-valved at the truncate apex. *Seeds* large, oblong, pendulous, compressed, surrounded by a large membranous wing. **DISTRIB.** Species 3; British India, Malaya.

Leaves ovate-oblong; fruit 2·5 in. long ... .. 1. *Z. indica*.  
 Leaves ovate-rotund; fruit 5-8 in. long ... .. 2. *Z. Clarkei*.

1. ZANONIA INDICA, Linn. Spec. Pl. ed. II, 1457. Slender, climbing to the extent of 30-50 feet, glabrous. *Leaves* coriaceous, ovate-oblong, acute; the base 3-nerved, rounded or somewhat emarginate; main nerves 6-8 pairs, curved, spreading, prominent beneath; length 3·5-6 in., breadth 2-3·5 in., petiole ·65-·8 in. *Fruit* cylindric-campanulate, glabrous, the apex truncate, 2·5 in. long; *seeds* flat, thin, 1·5-1·75 in. long; the nucleus oval, only ·6 in. long, the rest being wing. Blume Bijdr. 937; Ser. in DC. Prodr. III, 298; Roem. Syn. fasc. II, 117; Wight and Arn. Prodr. 340; Wight Ill. t. 103; Miq. Flor. Ind. Bat. I, Pt. I, 682; Thwaites' Enum. Pl. Zey. 124, 442; Clarke in Hook. fil. Flor. Br. Ind. II, 633; Trimen Flora Ceylon II, 261.

PERAK; *King's Collector* 7198, 7362.

2. ZANONIA CLARKEI, n. spec. King. Slender, 60-80 feet long, glabrous, the young branches deeply grooved. *Leaves* coriaceous, ovate-rotund, acute; the base broad, emarginate or slightly cordate, with 5-7 nerves radiating from the apex of the petiole (the lateral one on each side small); length 2·5-3·5 in., breadth 2·5-3 in., petiole ·75 in., tendrils bifid. *Flowers* unknown. *Fruit* ovoid-cylindric, smooth, 5-8 in. long,

and 3 in. in diam. *Seeds* flattened, about .1 in. thick, ovate, with 6 unequal deep narrow marginal lobes (those at the ends being the longest), the seed proper or nucleus papillose, 1 in. long and .75 in. broad, surrounded on all sides by a thin membranous wing nearly 1 in. wide.

PERAK; *King's Collector* 7230.

This fine species is known only from a single gathering of six specimens, none of which bears a flower. My friend Mr. C. B. Clarke, F.R.S., who was so kind as to compare for me at Kew the whole of my Malayan Cucurbits, notes on this as follows: "This is either a new *Zanonia* near *Z. indica*, Linn., or a new *Alsomitra* near *A. Capricornica*, F. Müll.—I think a *Zanonia*, whether the sepals turn out to be 5 or not. The 2-fid cirrhi may do for either genus. The spinose-margined seeds are not like those of *Zanonia*; but the ovoid, or sub-globose fruit is like nothing out of section *Macrozanonia*, Cogn. I call it *Zanonia*, n. spec."

#### 10. ALSOMITRA, Bth. & Hk. f.

Large climbers; tendrils simple or 2-fid. *Leaves* with 3 oblong entire leaflets. *Flowers* small, dioecious, white, in compound panicles with filiform branches. *Male*; calyx rotate, 5-partite, segments oblong, acute; corolla rotate, 5-partite, segments obtuse; stamens 5, filaments short, near together at the base; anthers small, oblong, straight, 1-celled. *Female*; calyx and corolla as in the male; ovary elongate-clavate, 1-celled; styles 3-4, conical, with semi-lunate stigmas; ovules very many, pendulous; placentas 3, thick, vertical, parietal. *Capsule* large, elongate-clavate, truncate and 3-valved at the apex. *Seeds* very many, compressed, vertical, in six rows, much corrugated, incised or horned on the margin with a terminal membranous wing longer than the seed. **DISTRIB.** Species 9; British India, Malaya, North Australia, S. America.

ALSOMITRA CLAVIGERA, Roem. Syn. fasc. II, p. 118. A slender glabrous climber. *Leaflets* fleshy, the middle the largest, oblong or oblong-lanceolate, the apex obtuse, the base narrowed, the edges entire, subsessile, eglandular, length 1.5-3 in., breadth .65-1 in. *Panicles* slender, twice as long as the leaves, longer in fruit. *Capsule* smooth, 1.25-1.5 in. long and .4 in. broad. *Seeds* dark, cinereous, shortly muricate. Cogniaux in DC. Mon. Phan. III, 927; Hook. fil. in Bot. Mag. t. 6017; Clarke in Hook. fil. Flor. Br. Ind. II, 634. *Zanonia sarcophylla*, Wall. Cat. 3724; Pl. As. Rar. II, 28, t. 133.

KEDAH; *Curtis* 2504.

#### Ordered LVI. ARALIACEÆ.

Trees or shrubs, very rarely herbs, often scandent, sometimes prickly. *Leaves* alternate, the uppermost rarely sub-opposite, long-

petioled, large, simple or compound; stipules adnate to the petiole, sometimes inconspicuous or 0. *Flowers* regular, small, often polygamous, in umbels racemes or umbellate panicles; bracts and bracteoles small or conspicuous; pedicels continuous with the base of the calyx or jointed. *Calyx-tube* adnate to the ovary; limb truncate, obsolete or with small teeth. *Petals* 5, rarely 6-7 or many, valvate or sub-imbricate, expanding or calyptrate. *Stamens* as many as and alternate with the petals (very many in *Tupidanthus*), inserted round an epigynous disc. *Ovary* inferior, 2-celled, or cells as many as the stamens, or 1-celled; styles as many as the cells, distinct or united; ovules solitary and pendulous in each cell. *Fruit* coriaceous or drupaceous, usually small, one or more cells sometimes suppressed. *Seed* pendulous, albumen uniform or ruminant; embryo minute, radicle next the hilum. **DISTRIB.** Species 400, chiefly tropical and subtropical, a few in the cool temperate zones.

Petals imbricate (slightly); pedicels of flowers jointed:—

Styles 2-5, free; leaves compound ... .. 1. *ARALIA*.

Styles 3 or 4, free; leaves simple, entire, lobed or pinnatifid; ovary 1-celled ... .. 2. *ARALIDIUM*.

Petals valvate; stamens not exceeding 12:—

Albumen uniform, ovary 4-12-celled, pedicels continuous with the flower, leaves simple or digitately compound:—

Fruit boldly ridged, never more than '3 in. long; leaves usually compound ... .. 3. *HEPTAPLEURUM*.

Fruit succulent, ovoid-rotund, '5 in. in diam.; leaves simple, large, rotund-reniform, lobed ... .. 4. *TREVESIA*.

Fruit succulent, '3 in. in diam., obscurely ridged; leaves simple, entire (palmately lobed in young shoots) ... .. 5. *DENDROPANAX*.

Albumen ruminant:—

Ovary 1-celled:—

Ovary 1-ovulate, leaves compound ... .. 6. *ARTHROPHYLLUM*.

Ovary with 2 ovules; fruit 2-celled, 2-seeded, leaves simple ... .. 7. *WARDENIA*.

Ovary 2-celled, pedicels continuous:—

Style distinct; leaves pinnately decomposed ... .. 8. *HETEROPANAX*.

Styles combined; leaves digitate, palmate or angled ... .. 9. *BRASSAIOPSIS*.

Ovary 4- or 5-celled, pedicels jointed ... .. 10. *HETEROPSIS*.

Petals valvate; stamens 30-50 ... .. 11. *TUPIDANTHUS*.

### 1. *ARALIA*, Linn.

Herbs, shrubs or small trees, glabrous, hairy or prickly. *Leaves* alternate or whorled, digitate, pinnate or compound-pinnate; leaflets

serrate or nearly entire; bracts and stipules not prominent. *Umbels* solitary or in racemes or panicles, rarely in compound umbels; pedicels usually jointed close under the flower. *Flowers* often polygamo-monoecious. *Calyx* with its margin truncate or 5-toothed. *Petals* 5, ovate, imbricate in bud. *Stamens* 5. *Ovary* 2-5-celled; styles 2-5, free or shortly connate at base. *Fruit* 4-5-celled, 4-5-angular, or subglobose, 2-3-celled. *Albumen* uniform. **DISTRIB.** Species about 50; extending from India and Malaya to Japan and North America.

Leaflets entire or minutely serrulate, densely ferrugineous-tomentose on the lower surface	...	...	...	1. <i>A. Thomsoni.</i>
Leaflets coarsely and somewhat unequally serrate, the lower surface with scattered flexuose white hairs	...	...	...	2. <i>A. armata.</i>
Leaflets obscurely undulate-serrate, quite glabrous on both surfaces, the lower sub-glaucous	...	...	...	3. <i>A. ferax.</i>

1. **ARALIA THOMSONI**, Seem. Rev. Hed. 91. A large prickly shrub, all parts more or less softly pubescent or tomentose. *Stem* slender, the prickles remote. *Leaves* large, 2-3-pinnate; leaflets thickly membranous, 5-9 in each ultimate pinnule, ovate-lanceolate, acuminate, the base rounded and somewhat oblique; the petiolules of all except the terminal very short (usually less than 1 in. long), that of the terminal leaflet 5 in. or upwards, the edges entire or minutely serrulate; upper surface sparsely strigose, the nerves and midrib pubescent; the lower softly tomentose; length 2.5-3.5 in., breadth 1-1.75 in. *Panicles* 15-20 in. long, with short sub-horizontal branches; the ultimate branches umbellate; the bracts narrowly lanceolate, .25 in long. *Fruit* .15 in. long, somewhat wrinkled, glabrous, the ridges broad. Clarke in Hook. fil. Flor. Br. Ind. II, 723.

PAHANG; *Ridley* 2450. PENANG; *King's Collector* 1574; *Curtis* 462. PERAK; *King's Collector* 7807, 8704, 10045.

2. **ARALIA ARMATA**, Seem. Rev. Hed. 91. A prickly shrub; stem slender, almost glabrous except the puberulous young parts. *Leaves* very large, 3-pinnate, the rachises puberulous; leaflets thinly membranous, 9-11 in each ultimate pinnule, ovate-lanceolate, acuminate, the edges coarsely and somewhat unequally serrate; the base rounded, slightly oblique or sub-cordate; sessile except the terminal one; petiolule of the terminal leaflet under 1 inch; length of leaflets 3-5 in., breadth 1.5-2 in.; upper surface with a few sparse adpressed hairs, otherwise glabrous; lower with scattered white flexuose hairs especially on the nerves and midrib. *Panicle* 15-18 in. long, pubescent in its ultimate 3-fid branches, the lower part glabrous, ultimate branchlets umbellate; the pedicels slender .3-.4 in. long, tomentose. *Fruit* nearly .2 in. long, glabrous; the ridges broad, flat. Kurz For. Flora Burma, I, 536;



Clarke in Hook. fil. Flor. Br. Ind. II, 723. *Panax armatum*, Wall. Cat. 4933; G. Don. Gen. Syst. III, 386.

KEDAH; *Curtis* 2526. DISTRIB. British India; in Burma, the Khasia Hills and on the lower slopes of the Eastern Himalaya.

3. *ARALIA FEROX*, Miq. Flor. Ind. Bat. I, Pt. I, 750. A lax spreading glabrous shrub, often scandent to 20 or 30 feet; the stems, branches, rachises of the leaves and inflorescence bearing numerous short recurved spines. *Leaves* 2-3-pinnate, the pinnæ 3 or 4 pairs; leaflets subcoriaceous, 3-5 in a pinna, the pairs opposite, ovate, acute, the bases rounded, the edges obscurely undulate-serrate; both surfaces glabrous, the upper shining when dry, the lower sub-glaucous; length 1-2 in., breadth .75-1 in.; petiolules unequal, the lateral .15-.3 in., the terminal .5-.65 in. long. *Panicle* terminal, 8-15 in. long and 6 in. across, with numerous slightly compressed horizontal branches, themselves branching and ultimately ending in numerous peduncled umbels of 10-15 long-pedicelled oblong flowers .1 in. long; the pedicels slender, .3-5 in. long. *Calyx-tube* campanulate, 10-ridged, the limb with 5 small triangular acute teeth. *Petals* ovate. *Fruit* ovate-globose, boldly 5-ridged, rather more than .1 in. long.

PERAK; *Scortechini* 142, 501; *King's Collector* 1037, 4434, 5089, 8438, 10568; *Wray* 2155.

## 2. *ARALIDIUM*, Miq.

Leaves large, simple, usually deeply lobed or pinnatifid, glabrous. *Flowers* male or hermaphrodite, in large compound panicles, minute. *Calyx-teeth* triangular, spreading, the tube campanulate. *Petals* 5, imbricate. *Stamens* 5. *Ovary* usually 3-celled, two of the cells soon aborting. *Styles* distinct, subulate. *Fruit* obliquely ovoid, drupaceous, 1 inch or more in length, 1-seeded; the seed solitary, rugose, pendulous, vertically sulcate; albumen very copious, coarsely ruminant, penetrated by outgrowing folds from the funicle; embryo small. DISTRIB; two species, both Malayan.

This is a remarkable genus of doubtful position. The large solitary seed, with a much developed funicle forming an expansion at the base of the coarsely ruminant albumen and sending processes into the latter, and the unisexual habit make it doubtful whether it should not be placed in *Cornaceæ* (to which Seemann referred it), rather than in *Araliaceæ*.

*ARALIDIUM PINNATIFIDUM*, Miq. Flor. Ind. Bat. I, 763, t. 13. A small tree without prickles, glabrous except the inflorescence. *Leaves* thinly coriaceous, irregularly lobed or coarsely pinnatifid, rarely entire and narrowly elliptic; length of the lobed or pinnatifid forms 10-18 in., breadth 7-10 in.; length of the entire leaves 4-10 in., breadth 2-4 in.; petiole stout, 1.5-5 in. long. *Panicles* many-branched, ferruginous-

puberulous, shorter than or as long as the leaves. *Petals* pubescent. *Fruit* narrowly ellipsoid, pointed at each end, glabrous, the pericarp thin, length 1.35 in., diam .6 in., damson-colored when ripe. *Miq. Flor. Ind. Bat. Suppl.* 340; *Clarke in Hook. fil. Flor. Br. Ind. II*, 726; *Hemsley in Hook. Ic. Plantar. t.* 1549.

PAHANG; *Ridley* 2439. SELANGOR; *Curtis* 2340. SINGAPORE; *Ridley*; *Hullett*, 485, 888; *King*. PAHANG; *Ridley* 2662. MALACCA; *Griffith* (*Kew Distrib.*) 2702; *Maingay* 676. PERAK; *Scortechini*; *Wray*; *King's Collector* (many numbers), a very common plant. *DISTRIB.* Sumatra, *Forbes* 2207.

The structure of the seed is well explained by Mr. Hemsley in his description and figure in *Hooker's Icones Plantarum*.

### 3. HEPTAPLIURUM, Gærtn.

Large shrubs or trees, glabrous or tomentose, without prickles. *Leaves* digitate, rarely compound-digitate or 1-foliolate; leaflets coriaceous, entire or remotely toothed or lobed, never closely serrate nor ciliate, those near the panicle usually entire; stipules often connate within the petiole and prominent. *Umbels* (rarely capitata) paniced or in compound racemes; bracts woolly, deciduous or persistent; pedicels not jointed under the flower; bracteoles few or 0, or rarely densely tufted. *Calyx-margin* toothed or truncate. *Petals* 5-6 or many, valvate. *Stamens* as many as the petals. *Ovary* cells as many as the petals, disc small or large; styles small, separate or combined in a short conical narrow cylindric column. *Fruit* subglobose, 5-6-angled. *Seeds* compressed, albumen uniform. *DISTRIB.* Species 55, in the tropics of the Old World.

- Leaves simple ... .. 1. *H. avene*.  
 Leaves all trifoliolate:—  
   Panicle longer than the leaves, slender; its branches long, spreading, laxly-flowered ... .. 2. *H. luridum*.  
   Panicle shorter than the leaves; its branches short, densely-flowered ... .. 3. *H. triste*.  
 Leaves all digitately 5-9-foliolate:—  
   Panicle simple or 2-branched, sub-racemose, only about 3 in. long; the lateral umbels subsessile, lax, few-flowered ... .. 4. *H. sub-racemosum*.  
   Panicle divided from the base or near it into several erect narrow branches 6-12 inches long; the lateral branches very short and bearing dense heads of subsessile flowers:—  
     Ovary 8-celled, leaves glaucous and with loose woolly hairs beneath ... .. 5. *H. Cephalotes*.  
     Ovary 5-celled:—  
       Both surfaces of the leaves quite glabrous ... .. 6. *H. Scortechinii*.  
       Lower surface of leaves tomentose ... .. 7. *H. tomentosum*.

- Panicle with few narrow erect branches bearing shortly peduncled umbels of pedicellate flowers:—
- Ovary 12-celled; leaflets 5, membranous, 7-12 in. long ... 8. *H. Singalangense.*
- Ovary 9-celled; leaflets 7-9, very coriaceous, 3-5 in. long ... 9. *H. lati-foliolatum.*
- Ovary 5-celled:—
- Main nerves of leaflets only 2 or 3 pairs, the basal prominent; reticulations rather wide, not prominent; panicles very narrow, covered, up to the bases of the pedicels, with minute stellate hair ... 10. *H. subulatum.*
- Main nerves of leaflets 5 or 6 pairs, basal nerves prominent; panicles glabrous (rarely hairy) narrow in flower, spreading in fruit ... 11. *H. venulosum.*
- Panicle with spreading branches:—
- Branches of the panicle umbellate:—
- Ovary 5-celled; reticulations of leaves wide, distinct ... 12. *H. ellipticum.*
- Ovary 6-celled:—
- Common petiole 1-2.5 in. long; leaflets lanceolate or oblanceolate, caudate-acuminate, much narrowed to the base, 1.5-3.5 in. long; flower-buds globular, .1 in. in diam.; fruit .1 in. long ... 13. *H. scandens.*
- Common petiole 2-4 in. long; leaflets ovate-lanceolate, shortly caudate-acuminate, the bases rounded, 2-4 in. long; flower-buds oblong, about .2 in. long; fruit .25 in. long ... 14. *H. affine.*
- Common petiole 10-24 in. long; leaflets oblong-elliptic, shortly and abruptly acuminate, 4-12 in. long; flower-buds sub-globular, .1 in. in diam.; fruit elliptic, .25-3 in. long ... 15. *H. Hullettii.*
- Common petiole 5-10 in. long; leaflets oblong-elliptic or oblanceolate-oblong, acute, 5-10 in. long; flower-buds globular, .15 in. in diam.; fruit ovoid, .25 in. long ... 16. *H. Ridleyi.*
- Common petiole 2-2.25 in. long; leaflets lanceolate, acute, narrowed to the base, 1.5-2.5 in. long; flower-buds oblong, .2 in. long, fruit .3 in. long .. 17. *H. nervosum.*
- Branches of the panicle racemose ... 18. *H. Wrayi.*
- Lower leaves large, digitately decomposed:—
- Leaflets entire, narrowly oblong, acuminate, 2-3.5 in. long, panicle 8 in. long ... 19. *H. biternatum.*
- Leaflets usually entire, 2.5-7 in. long, panicle 10-15 in. long; fruit oblong ... 20. *H. heterophyllum.*
- Leaves bipinnate, leaflets coarsely toothed; fruits sub-globular ... 21. *H. Curtisii.*

1. HEPTAPLEURUM AVENE, Seem. Rev. Hed. 43. Scandent; young branches with striate rugulose glabrous bark, brown when dry. *Leaves*

simple, coriaceous, narrowly oblong, acute, narrowed to the base, the edges slightly recurved; both surfaces glabrous, dull when dry; main nerves about 12 pairs, faint, sub-horizontal; length 3·5–5·25 in., breadth ·9–1·2 in.; petiole ·75–1·25, thickened near the apex. *Panicles* single or 2 or 3, terminal, puberulous, half as long as the leaves, erect; the few branches rather close together, about ·25 or ·3 in. long, each bearing 3–5 pedicellate flowers; the buds ·15 in., ovoid, their pedicels ·2 in. long; bracts lanceolate, deciduous. *Calyx-rim* narrow; petals, stamens and stigmas 6. *Fruit* ellipsoid, as large as a pea, sulcate. *Sciadophyllum avene*, Herb. Korthals.

SINGAPORE; *Ridley* 5840, 6337. **DISTRIB.** Sumatra.

At once distinguished in the genus by its oblong simple leaves.

2. **HEPTAPLEURUM LURIDUM**, new species. An epiphytic shrub 2–3 feet long; branches with rugulose glabrous bark. *Leaves* trifoliolate, with a common petiole 1–1·75 in. long, glabrous, fleshy when fresh, vertically rugose when dry; leaflets very coriaceous, narrowly elliptic-oblong, slightly oblique, tapering gradually to each end; the edges entire, much recurved when dry; both surfaces quite glabrous, the nerves and veins very indistinct even when dry; length 2·5–4 in., breadth ·5–·75 in.; petiolules unequal, thick, the lateral ·15–·25 in. long, the terminal about ·4 in. *Panicle* terminal, longer than the leaves; its branches few, slender, long, spreading, glabrous; the ultimate branchlets 1–1·5 in. long, bearing umbels of 3–8 broadly ovoid glabrous flowers ·1 in. long; their pedicels at first only about ·1 in. long, but two or three times as long in fruit. *Calyx-tube* shortly campanulate; its mouth truncate, entire. *Petals* completely united into a calyptra. *Stamens* 6, erect, the filaments short. *Styles* united into a short conical column; the stigmas 6, small, occupying the corners of its truncate apex.

PERAK; *Scortechini* 1191; *King's Collector* 8304.

A very distinct small species easily recognised by its narrow very acuminate aenous leaflets borne on fleshy petioles, and by its slender spreading long-branched few-flowered panicles.

3. **HEPTAPLEURUM TRISTE**, new species. A tree; young branches as thick as a swan's-quill, glabrous, pale when dry. *Leaves* 3-foliolate, the common petiole 1·5–2 in. long; leaflets thickly coriaceous, glabrous, broadly elliptic, blunt or shortly apiculate, the base rounded; the edges entire, boldly recurved when dry; main nerves 10 to 12 pairs, close together, indistinct on both surfaces; length 2·25–3·25 in., breadth 1·5–2 in.; petiolules unequal, the lateral pair ·5 in. long, the middle one ·8 in. *Panicle* terminal, shorter than the leaves, glabrous, divided from the base into 2 or 3 spreading branches, ebracteate; the branchlets about ·5 in. long (longer in fruit), each ending in an umbel of 10–20 ovate

flowers, .15 in. long, their pedicels .1 in. long. *Calyx-tube* campanulate; the limb truncate, narrow. *Petals* 5, broadly elliptic, blunt, reflexed. *Fruit* narrowly oblong, pointed, deeply 5-ridged, glabrous, crowned by the short conical style-column, .2 in. long, glabrous.

PERAK; on Ulu Batang Padong, at an elevation of about 4900 feet; *Wray* 1509.

A species near *H. ellipticum* but readily distinguished from that in the Herbarium by its dull broad coriaceous leaflets, more widely campanulate calyx-tube, and larger fruit.

4. *HEPTAPLEURUM SUB-RACEMOSUM*, new species. A shrub 2-3 feet high; young branches with thick corky glabrous bark, pale when dry. *Leaves* trifoliolate or sometimes 5-foliolate, the common petiole 1.5-2.5 in. long, glabrous. *Leaflets* coriaceous, narrowly elliptic-lanceolate, caudate-acuminate, narrowed at the base, the edges entire and slightly revolute; both surfaces glabrous, distinctly and finely reticulate when dry; length 2.25-4 in., breadth .75-1.1 in.; petiolules unequal, .3-.4 in. long, that of the terminal leaflet .8-1.25 in. long, thickened at the apex. *Panicle* solitary, terminal, very narrow, sub-racemose, 2-branched, only about 3 inches long and about .65 in. across; the branchlets only .1-2 in. long, each ending in an umbel of 3-5 oblong, green flowers .15 in. long; rim of *calyx* very narrow. *Fruit* oblong, .2 in. long, glabrous, with 5 blunt ridges, pale green tipped with bluish, 5-celled.

PERAK; *King's Collector* 8283.

Readily recognised by its small caudate-acuminate narrow leaflets, much and prominently reticulated when dry; and by its short narrow racemoid panicles.

5. *HEPTAPLEURUM CEPHATOTES*, Clarke in *Flor. Br. Ind.* II, 731. A large tree. *Leaves* digitate, their petioles rather slender, 1.5-3.5 in. long, glaucous; leaflets about 7, oblong-elliptic, the apex abruptly and shortly acuminate, the base rounded, the edges entire and slightly recurved when dry; upper surface shining, glabrous; the lower dull, glaucous, and bearing when young some quickly deciduous loose woolly hairs. *Panicle* minutely tomentose, terminal, consisting of numerous sub-erect branches 6-12 inches long, bearing shortly peduncled globose ebracteolate dense capitula. *Fruit* oblong, ribbed, 8-celled, covered with stellate white tomentum and crowned by the broad cluster of short styles; disc large, spongy. *H. capitatum*, Seem. *Rev. Hed.* 15 (in part).

MALACCA; *Griffith* (Kew Distrib.) 2700. SINGAPORE; *Ridley* 3973, 6409. PENANG; *Curtis* 837. PERAK; *Wray* 1542; *Scortechini* 391.

6. *HEPTAPLEURUM SCORTECHINII*, new species. An epiphytic shrub, the young branches stout. *Leaves* digitate; the common petiole terete, glabrous, stout, 2.5-3.5 feet long; leaflets 8-10, very coriaceous, oblong

or oblong-elliptic, the apex blunt or shortly apiculate, the base rounded, the edges entire and recurved when dry; both surfaces quite glabrous, not reticulate; main nerves 6-9 pairs, slightly prominent on the lower surface; length 9-13 in., breadth 4-6 in.; petiolules unequal, 2.5-5 in. long. *Panicle* terminal, dividing into several narrow raceme-like branches, 10-20 inches long, covered with pale scurfy tomentum; the branchlets 40 or 50 in number and .35 to .75 in. long, each with a broadly ovate convolute woolly bract at its base, and at its apex a dense globular umbel of sub-globular flowers .1 in. in diam. and borne on pedicels .05 in. long. *Calyx* truncate, tapering to the base. *Petals* 6 or 7, narrowly lanceolate. *Stigmas* free, ovary 5-celled. *Fruit* unknown.

PERAK; *Scortechini* 2008.

Collected only by the late Father Scortechini, whose specimens unfortunately are scanty and rather fragmentary. A very distinct species, in general appearance resembling *H. Cephotos*, Clarke and *H. rigidum*, Seem. The leaflets of the latter have however twice as many main lateral nerves, although their length is not greater.

7. HEPTAPLEURUM TOMENTOSUM, Hassk. in *Cat. Hort. Bot. Bogor.* (1844), p. 165. A half-scandent shrub, 6-8 in. high; the young branches stout, deciduously stellate-pubescent, the older glabrous. *Leaves* digitate; the common petiole 9-12 in. long, densely covered with rusty stellate tomentum, the intra-petiolar stipules about .75 in. long. *Leaflets* 5-7, coriaceous, oblong-elliptic, caudate-acuminate, slightly narrowed to the base, the edges entire and slightly revolute; the upper surface boldly bullate and finely reticulate, quite glabrous, pale olivaceous when dry; the lower pale brown, more or less closely covered with pale brown stellate hairs; length 8-10 in., breadth 2.75-3.5 in.; petiolules unequal, 1.5-2.5 in. long, tomentose. *Panicles* usually two together, terminal, 4-5 in. long, racemose; the lateral branches about 12, short, .2-4 in. long, each bearing a sub-globular umbel of 8-10, ovoid, blunt, glabrous flowers .15 in. long; their pedicels .1 in. long, pubescent. *Calyx-tube* funnel-shaped, the rim narrow. *Petals* 5, white, glabrous, calyptrate. *Stamens* longer than the petals. *Styles* 5, conjoined, papilliform, their apices free. *Fruit* .2 in. long, narrowly oblong, 5-ridged, 5-celled. *Sciadophyllum tomentosum*, Blume *Bijdr.* 877; DC. *Prod.* IV, 260. *Paratropia tomentosa*, Miq. in *Bonplandia* for 1856, p. 138; *Flor. Ind. Bat.* I, Pt. I, 753; *Ann. Mus. Lugd. Bat.* I, 23.

PERAK; *Scortechini*, *Wray* 2202, 3152; *King's Collector* 2066, 2216, 2569, 7253, 8733. SELANGOR; *Curtis* 2341. DISTRIB. Sumatra; *Forbes*, 2611.

I have seen no authentically-named specimen of this from the Leiden Herbarium, but the Perak plant agrees so completely with Miquel's description that I have no doubt of the correctness of my identification.

8. *HEPTAPLEURUM SINGALANGENSE*, Seem. Rev. Hed. 42. Scandent, glabrous. *Leaves* digitate; common petiole 12–15 in. long, stout; leaflets 5, membranous, elliptic, shortly acuminate, the base slightly narrowed, the edges with a few irregular remote teeth or entire; both surfaces glabrous, faintly reticulate; main nerves 7 or 8 pairs, curved, spreading; length 7–12 in., breadth 3·25–5·25 in., petiolules 1·25–2·5 in., thickened at the base. *Panicle* 12–18 in. long, covered with deciduous rusty stellate pubescence, very narrow, (about 2 in. wide); the branches numerous, about 5 in. long, each ending in an umbel of 5–10 oblong obovoid pedicelled flowers 25 in. long, their pedicels 2–3 in. long. *Calyx-tube* shortly campanulate, minutely scaly; its limb narrow, truncate, undulate. *Petals* 9, fleshy, narrow, slightly unequal, connate by their edges. *Stamens* 9. *Stigmas* united into a notched fleshy ring, ovary 12-celled. *Fruit* unknown. *Paratropia Singalense*, Miq. in Ann. Mus. Lugd. Bat. I, 23. *Agalma redivivum*, Seem. Rev. Hed. 25.

PERAK; *Scortechini* 390; *Curtis* 3170.

The specimens which I have seen are few. In foliage they agree with the specimen in Kew named *Agalma redivivum*, which however Seemann describes as having 7–8-merous flowers. In other respects they agree with Seemann's description of that plant. They also agree with Miquel's full description of his *Paratropia Singalangense*, except as to the length of the petiole which Miquel gives as only 4–6 inches, a measurement so much out of proportion with those he gives for the petiolules, (1–2·5 in.) and leaflets, that I cannot help suspecting some clerical error.

9. *HEPTAPLEURUM LATIFOLIOLATUM*, new species. A bush with stout branches. *Leaves* digitate; the common petiole stout, glabrous, somewhat compressed, 7–11 in. long; leaflets thickly coriaceous, ovate-rotund, shortly acuminate or blunt, the base rounded; the edges entire, slightly recurved when dry; both surfaces glabrous, the upper shining, the lower dull and sub-glaucous; main lateral nerves 7 or 8 pairs, spreading, curving upwards, prominent on the lower surface, depressed on the upper when dry; length 3–5 in., breadth 1·75–3·5 in.; petiolules 8–1·5 in., rather stout. *Panicles* terminal, in pairs, 5–8 in. long, glabrous; the branches short, horizontal, each bearing at its apex an umbel of 10–15 pedicelled flowers; pedicels 3 in. long. *Fruit* broadly ovoid, deeply 9-ridged, 9-celled, glabrous, crowned by the 9 very short free styles, and 15 in. in diam., red when ripe.

PERAK; on Gunong Babu at an elevation of about 5000 feet; *Wray* 3927.

10. *HEPTAPLEURUM SUBULATUM*, Seem. Rev. Hed. 42. Scandent, glabrous. *Leaves* digitate; the common petiole 2–6 in. long, slender, glabrous, terete; leaflets coriaceous, oblong-elliptic or elliptic, shortly acuminate, tapering to the base; the edges entire, revolute when dry; both surfaces glabrous and reticulate but not prominently so, the upper

shining, the lower dull when dry; midrib prominent on the lower surface as also the 4 oblique, basal, and 2-3 pairs of sub-horizontal main nerves; length 2.5-7 in., breadth 1-3.5 in.; petiolules unequal, .2-2 in., swollen near the apex. *Panicle* terminal, stellately puberulous, shorter than the leaves while in flower, longer in fruit, bearing many very narrow racemoid branches each with an acuminate lanceolate bract 1 in. long at its base; branchlets very short, from .15 in. when in flower to .5 in. when in fruit, stellately puberulous, each bearing an umbel of 12-20 flowers; buds depressed, globular, glabrous, .05 in. in diam.; their pedicels .2 in. long, slender. *Fruit* rather broadly ovoid, bluntly 5-ridged, 5-celled, glabrous, .15 in. long. Clarke in Flor. Br. Ind. II, 730. *Paratropia subulata*, Miq. in Ann. Mus. Lugd. Bat. I, 22.

MALACCA; *Griffith* (Kew Distrib.) 2690; MAINGAY; 681, (Kew Distrib.) *Derry*. PAHANG; *Ridley* 1632, 5818. PERAK; *Scortechini*; *Wray* 872, 3090, 3639; *King's Collector* 773, 1102, 2343. DISTRIB. Sumatra.

This closely resembles *H. venulosum*, Seem., and is not always readily distinguishable from that species. The best marks of this appear to me to be the prominence of the basal nerves and the fewness of the other main nerves (only 2 or 3 pairs); and the longer narrower panicles which, up to the pedicels of the flowers, are covered with minute stellate hairs. The majority of the specimens of *H. venulosum*, Seem. have glabrous panicles, but those of var. *macrophylla* are hairy, and the leaves have many more lateral nerves.

11. HEPTAPLEURUM VENCLOSUM, Seem. Rev. Hed. 44. Scandent; young branches rather slender, glabrous. *Leaves* digitate; common petiole slender, terete, glabrous, 4-6 in. long; leaflets thinly coriaceous, oblanceolate-elliptic to oblong-lanceolate, shortly acuminate, narrowed to the base, the edges entire; both surfaces shining, glabrous, conspicuously and minutely reticulate; length 3-7 in., breadth 1.25-2.75 in.; petiolules unequal, slender, varying from .5-1.5 in. long in the same leaf. *Panicle* varying in length but usually shorter than the leaves, terminal, glabrous or occasionally slightly pubescent, (stellate-pubescent in var. *macrophylla*), dividing into several narrow branches bearing short branchlets each terminating in an umbel of 10-15 depressed-globular flowers .1 in. in diam.; their pedicels unequal, slender, .15-3 in. in length. *Fruit* ovoid, bluntly 5-ridged, 5-celled, glabrous, .15 in. long, yellow when ripe. Clarke in Hook. fil. Flor. Br. Ind. II, 729; Brand. For. Flor. 294; Kurz For. Flor. I, 538. *Paratropia venulosa*, W. & A. Prodr. 377; Wight Ill. t. 118. *Hedera venosa*, Wall. Cat. 4923. *H. terebinthacea*, Wall. Cat. 4920, (partly.). *Avalia digitata*, Roxb. Hort. Beng. 22; Flor. Ind. II, 107.

ANDAMAN ISLANDS; *King's Collectors*. MALACCA; *Derry*.

This species, so common from the base of the Eastern Himalaya southwards



through Assam to Burma, is replaced in the Malayan Peninsula by the closely allied species *H. ellipticum*, which differs from this as noted under that species. Mr. Clarke, in Flor. Br. India, however, reduces *H. ellipticum* to *H. venulosum*, a course in favour of which there is a good deal to be said.

12. *HEPTAPLEURUM ELLIPTICUM*, Seem. Rev. Hed. 43. Scandent; young branches with pale brown glabrous bark. *Leaves* digitate; the common petiole 4–6 in. long, glabrous; leaflets 5–7, coriaceous, more or less broadly elliptic, sometimes elliptic-rotund, apiculate, subapiculate or obtuse, the base rounded or sub-cuneate; the edges entire, revolute when dry; both surfaces glabrous and rather dull when dry; main nerves 4 or 5 pairs, the reticulations wide, inconspicuous; length 2·5–7 in., breadth 1·75–4 in.; petiolules unequal, .75–1·5 in., that of the middle leaflet 2 in. *Panicle* about as long as the leaves, terminal, glabrous, lax, open, the branches long, spreading and bearing few-flowered umbels on long slender peduncles; flowers globular-ovoid, .1 in. long or less, on slender pedicels .15–.2 in. long. *Fruit* oblong, yellowish, with 5 ridges and 5 cells. *Paratropia elliptica*, Miq. in Bonplandia 1856, p. 138; Flor. Ind. Bat. I, Pt. I, p. 756; in Ann. Mus. Lugd. Bat. I, 20; *Sciadophyllum ellipticum*, Blume Bijdr. 878; DC. Prodr. IV, 260.

SINGAPORE; *Ridley* 5839, 6399. MALACCA; *Derry* 1187, 1215. PENANG; *Curtis* 972. PERAK; *Scortechini*; *Wray* 2020, 2136; *King's Collector* 2541, 4733, 10375, 10534. ANDAMAN AND NICOBAR ISLANDS; *King's Collector*.

This resembles *H. venulosum*, Seem, but the reticulations on the leaves of this are wider and less distinct than in that; and the panicles of this have spreading, quite glabrous, lax branches.

13. *HEPTAPLEURUM SCANDENS*, Seem. Rev. Hed. 43. A slender creeper 3–5 in. long, the stem pale and corky. *Leaves* small, digitate; common petiole 1–2·5 in. long, slender; leaflets 3–5, thinly coriaceous, lanceolate, caudate-acuminate, tapering much to the base, the edges entire and somewhat recurved; both surfaces glabrous, the upper smooth and shining, the lower dull and reticulate; length 1·5–3·5 in., breadth .5–.8 in.; petiolules subequal, .2–.25 in. long. *Panicles* longer than the leaves, slender, 4–8 in. long; the branches spreading horizontally, simple, each ending in an umbel of flowers on a slender pedicel nearly .75 in. long; buds globular, .1 in. in diam. *Fruit* elliptic, boldly 5-ridged, 5-celled, .1 in. long. *Paratropia scandens*, Miq. in Bonplandia 1856, p. 138; Flor. Ind. Bat. I, Pt. I. 757. *P. brachybotrya*, Miq. Flor. Ind. Bat. I, Pt. I, 755. *Sciadophyllum scandens*, Blume Bijdr. 878.

PERAK; *Wray* 1844, 2401, 2880; *Curtis* 2687; *Scortechini* 218, 1352; *King's Collector* 4304. *DISTRIB.* Java, Sumatra.

A very slender glabrous species, at once distinguished by its small lanceolate, caudate-acuminate, digitate leaflets.

14. *HEPTAPLEURUM AFFINE*, new species. A shrub 6–8 feet high, semi-scandent; young branches as thick as a goose-quill, shining, glabrous; common petiole 2–4 in. long, slender, the stipule about  $\cdot65$  in., both glabrous; leaflets 5 or 6, thinly coriaceous, ovate-lanceolate to elliptic, acuminate, the base sometimes narrowed but always rounded, the edges entire; length 2.25–4 in., breadth 1.25–1.75 in.; petiolules somewhat unequal,  $\cdot75$ –1.5 in. long. *Panicle* terminal, when young furfuraceously puberulous towards the base, ultimately quite glabrous everywhere, 2.5–5 in. long and almost as broad; the main branches 3 or 4, spreading and bearing, in pairs or whorls of 3, six to twelve ultimate ebracteate branches  $\cdot5$ – $\cdot75$  in. long, each terminating in an umbel of 7–10 pedicellate broadly ovate flowers nearly  $\cdot2$  in. long, the pedicels  $\cdot2$  in. long. *Fruit* broadly ovate, apiculate, boldly 6-ridged, 6-celled, glabrous, nearly  $\cdot25$  in. long.

PERAK; at elevations of from 3000 to 5000 feet. *Scortechini* 333, 486; *King's Collector* 3827; *Wray* 4121.

This in many respects resembles *H. ellipticum*, but has larger flowers and its fruit is on shorter pedicels.

15. *HEPTAPLEURUM HULLETTII*, new species. A small tree, 10–15 feet high; branches stout, rugulose, deciduously pubescent. *Leaves* large, digitate; the common petiole terete, glabrous, 10–24 in. long; leaflets 7–11, coriaceous, oblong or oblong-elliptic, occasionally somewhat broader in the upper than in the lower half, shortly and abruptly acuminate, slightly narrowed to the rounded base; both surfaces glabrous, not reticulate, the midrib prominent; main nerves 5–8 pairs, distant, slightly curved and ascending, prominent on the lower surface when dry, obsolete on the upper; length 4–12 in., breadth 1.5–3.25 in.; petiolules 1.25–3.5 in., slender, glabrous. *Panicles* 9–12 inches long, terminal, several together, long and narrow, with short horizontal slender branches from  $\cdot5$  to 1 in. long, bearing terminal umbels of 8–12 small 6-merous sub-globular flowers  $\cdot1$  in. in diam. *Fruit* elliptic, 6-ridged, 6-celled, crowned by the 6 short distinct styles, glabrous, pedicels  $\cdot25$ – $\cdot3$  in. long.

SINGAPORE; *Ridley* 447, 4591, 6012; *Wray* 2323; *King's Collector* 3048. JOHORE; *King* and *Hullett*.

A species resembling *H. dvaricata*, Miq.; but having leaflets with fewer nerves and no reticulations, much longer panicles and narrower fruit. It is allied also to *H. longifolium*, Seem., but the leaflets of that species have greatly more numerous main nerves, and the panicles are densely clothed with broad scale-like hairs and have longer lateral branchlets.

16. *HEPTAPLEURUM RIDLEYI*, new species. Scandent; young branches stout, glabrous. *Leaves* digitate; common petiole terete, glabrous, 5–10 in. long; leaflets 5, very coriaceous, oblong, oblong-elliptic or oblanceolate-oblong, acute, slightly narrowed at the base; the edges

entire, very slightly revolute when dry; both surfaces glabrous, the reticulations faint when dry; main nerves very slightly prominent on the lower surface, about 8 pairs, spreading, the intermediate nerves almost as conspicuous; length 4–6·5 in., breadth ·2–2·75 in.; petiolules unequal, ·75–2·25 in. *Panicle* terminal, glabrous, 5 or 6 in. long, with several spreading branches; the branchlets few, about ·5 in. long, each bearing an umbel of 10–20 globular flowers ·15 in. in diam. *Calyx-tube* short, widely campanulate, the limb narrowed and truncate. *Petals* 5, elliptic, glabrous. *Fruit* ovoid, somewhat succulent, smooth, faintly 6-ridged, ·25 in. long, 6-celled.

SINGAPORE; *Ridley* 6336 and perhaps also 1890a.

17. *HEPTAPLEURUM NERVOSUM*, new species. A small shrub; branches with glabrous bark pale brown when dry. *Leaves* digitate; the common petiole terete, 2–2·25 in. long; leaflets 6, very coriaceous, lanceolate, acute, the base narrowed; the edges entire, much recurved when dry; both surfaces glabrous, the upper shining, the lower dull; main nerves 7–10 pairs, straight, sub-horizontal, very prominent on the lower surface and deeply impressed on the upper when dry, length 1·5–2·5 in., breadth ·5–·9 in.; petiolules unequal, the middle two about ·75 in. long, the others about half as long. *Panicle* terminal, from 1·5–2 in. long, rusty-puberulous at first, afterwards glabrous, branches about 2, spreading, with short bracteoles at the base and above it, each ending in an umbel of 8–10 oblong pedicelled glabrous flowers ·2 in. long, their pedicels ·1–·15 in. long. *Calyx-tube* cylindrical-campanulate, the limb truncate and entire. *Petals* narrowly triangular. *Fruit* rotund-ovoid, boldly 6-ridged, 6-celled, glabrous, ·3 in. long.

PERAK, on Gunong Chabong; *Scortechini*.

A very distinct small species with rather large flowers and fruit for the genus, and prominently-nerved very coriaceous leaflets.

18. *HEPTAPLEURUM WRATI*, new species. A small tree; young branches as thick as a swan's quill, furfuraceous. *Leaves* digitate; common petiole 6–9 in. long, slender, glabrous; leaflets 7–9, thinly coriaceous, elliptic, abruptly shortly and sharply acuminate, the base rounded, the edges with shallow distant sharp serrations; upper surface glabrous, the lower glaucous and with scattered minute stellate hairy scales; main nerves 7 or 9 pairs, prominent beneath, length 3–5 in., breadth 1·75–2·25 in.; petiolules unequal, 1·5–2·5 in. long. *Panicle* terminal, longer than the leaves, furfuraceous stellate-pubescent, bearing a few rather distant, horizontal or deflexed many-flowered racemes. *Flowers* ·15 in. in diam., their pedicels ·2 in. long. *Calyx-tube* funnel-shaped, its mouth with 5 short triangular spreading teeth. *Petals* 5, elliptic-oblong, glabrous, reflexed. *Fruit* globular, prominently 5-ridged,

crowned by the long confluent column of styles, glabrous, 5-celled, .15 in. in diam.

PERAK; on Gunong Brumber Pahang, at an elevation of about 7000 feet, *Wray* 1585.

A very distinct species, at once distinguishable by its racemose panicles, and leaflets glaucous on the lower surface and with serrate edges.

19. *HEPTAPLEURUM BITERNATUM*, Clarke in Hook. fil. Flor. Br. Ind. II, 735. A shrub several feet high; the young shoots and the under surfaces of the leaves deciduously stellate-pubescent. *Leaves* digitately decomposed or twice pinnate, with ternate leaflets at each node of the rachis; leaflets coriaceous, narrowly-oblong, acuminate, entire, the base slightly narrowed and rounded; length 2-3.5 in., breadth .5-.75 in., petiolules .1 in. long or less, that of the terminal leaflet .4 in.; both surfaces minutely reticulate and shining, the upper glabrous, the lower with deciduous stellate pubescence. *Panicle* 8 in. long, but only about 1.5 in. across; the branches little-divided, stellate-hairy; bracts deciduous, pedicels .2 in. long.

MALACCA; *Maingay* (Kew Distrib.) 684.

Known only by Maingay's fragmentary specimens.

20. *HEPTAPLEURUM HETEROPHYLLUM*, Seem. Rev. Hed. 40. A bush or small tree 8-12 feet high. *Lower leaves* large, ternately decomposed, 24 in. across; common petiole 12-24 in. long; the upper leaves smaller and only twice digitate; the leaflets in all 3 to 5 on each petiolule, thinly coriaceous, variable in shape, oblong-lanceolate to elliptic or broadly ovate, shortly acuminate, narrowed or rounded at the base; the edges entire, rarely with 1 or 2 teeth near the apex; both surfaces minutely reticulate and glabrous, the lower minutely dotted; length 2.5-7 or even 9 in., breadth 1-2.25 in.; petiolules of the lower leaflets .1-.25 in., that of the terminal twice as long. *Panicles* with deciduous pale stellate pubescence, solitary or several together, 10-15 in. long, and only 1.5-2 in. across; the branches horizontal, slender, each ending in an umbel of flowers on slender pedicels, the flowers bearing fertile pistils smaller than those with fertile stamens. *Fruit* narrowly oblong, boldly 5-ribbed, glabrous, 5-celled, nearly .25 in. long, claret-coloured when ripe. Clarke in Hook. fil. Flor. Br. Ind. II, 731. *Hedera heterophylla*, Wall. Cat. 4919; G. Don. Gen. Syst. III, 394. *Paratroxia heterophylla*, Presl Epimel. Bot. 250; Miq. Flor. Ind. Bat. I, Pt. I, 761.

PENANG; *Wallich*, *Curtis* 241, 2301 and possibly 1950. PERAK; *Scortechini* 145, 664; *King's Collector* 718, 2688, 8640, 8769.

21. *HEPTAPLEURUM CURTISII*, new species. A large shrub. *Lower leaves* bipinnate, the upper trifoliolate; common petioles of both about .8 in. long; leaflets thinly coriaceous, oblong-elliptic, sometimes slightly

obovate, the apex shortly acuminate, the edges entire in the lower half but with a few unequal scanty coarse sharp teeth in the upper half; the base slightly narrowed, sometimes oblique; both surfaces quite glabrous, shining and finely reticulate when dry; length 3–6 in., breadth 1·5–2·5 in.; petiolules unequal, the lateral 1 in. long or absent, the terminal 35–8 in. *Panicle* terminal, shorter than the leaf-petioles, with several rusty stellate-tomentose bracts 75 in. long at its base, 2-branched; the branches narrow, sparsely covered with scurfy pubescence; the lateral branchlets about 75 in. long, slender, each bearing at its apex a crowded umbel of from 10–20 oblong flowers on pedicels 15–3 in. long. *Fruit* oblong, boldly 5-ribbed, crowned by the conical disc bearing 5 small rounded stigmas at its corners, 5-celled.

PENANG; at Pulo Betong, 1950.

I have seen only two specimens (and they are both of the same gathering) of this very distinct species.

#### 4. TREVESIA, Vis.

Shrubs or small trees, prickly or unarmed, glabrous or stellate-hairy. *Leaves* palmifid or palmisect; petioles often united by a wing at their base; stipules united within the petiole, or obsolete. *Flowers* polygamous, large for the Order; umbels paniced; pedicels not jointed under the flower; bracts small or 0. *Calyx-margin* entire or toothed. *Petals* 8–12, valvate, somewhat thick, often cohering as a cap in the fertile flowers. *Stamens* equal in number to the petals. *Ovary* with as many cells as the petals; styles connate into a short column. *Fruit* ovoid, large for the Order. *Seeds* compressed; albumen uniform. **DISTRIB.** Species about 10; natives of Eastern India, Malaya and Polynesia.

TREVESIA PALMATA, Vis. in Mem. Acad. Torino, Ser. 2, IV, 262, with fig. A small single-stemmed tree 10–25 feet high; young shoots ferruginous-pubescent and very prickly. *Leaves* coriaceous, large (12–24 in. in diam.), rotund in general outline, deeply palmatifid; or, in young shoots, palmisect, widely cordate at the base, the lobes acuminate, their edges serrate or sometimes lobulate; glabrous when adult or with a few small rufous stellate hairs on the lower surface; the lobules contracted in the middle to a pseudo-petiolule (in var. *cheirantha*); petiole often prickly, 6 to 20 in. long. *Panicles* 12–30 in. long, the branches spreading, when young clothed with reddish-brown tomentum; bracts oblong, 1 in. long, usually deciduous; pedicels 1–1·5 in. long. *Flower-buds* 12 in. in diam. *Fruit* ovoid-rotund, the ribs not prominent, crowned by the stout style, fleshy, 5 in. in diam. *Seem.* Rev. Hed. 77; *Kurz For. Flora Burma*, I, 539; *Clarke in Flor. Br. Ind.* II, 732; *Bœrlage in Ann.*

Jard. Bot. Buitenzorg VI, 108. *Gastonia palmata*, Roxb. Hort. Beng. 33; Flor. Ind. II, 407; Lindl. in Bot. Reg. t. 894. *Gilbertia palmata*, DC. Prodr. IV, 256. *Hedera ferruginea* and *H. palmata*, Wall. Cat. 4909 and 4910 (partly). *Brassaiopsis confluens*, Seem. Rev. Hed. 18 (as to the leaves). *Aralia dubia*, Spreng. Syst. Veg. IV, 2, p. 125.

PERAK; *Scortechini*; *King's Collector* 4435, 6715.

VAR. *cheirantha*, Clarke in Flor. Br. Ind. II, 732; laminæ of the lobes cut away in the middle so as to expose the midrib and form a pseudo-petiolule. *Hedera? cheirantha*, Jack in Wall. Cat. 4925; Wall. Cat. 4910 in part.

PERAK; *Wray* 2322; *King's Collector* 2308; *Scortechini* 344.

### 5. DENDROPANAX, Decne and Planch.

Unarmed glabrous trees or shrubs. *Leaves* simple, entire, (palmately 3-5-lobed on young shoots). *Umbels* solitary or in small panicles; bracts small or none; pedicels not jointed under the flower. Limb of the calyx entire or 5-toothed. *Petals* 5, free, valvate, rather thick. *Stamens* 5. *Styles* united into a column at the base, free at the apex. *Fruit* globose or ellipsoid, succulent, distinctly or obscurely 5-ribbed. *Seeds* compressed; albumen uniform. DISTRIB. about 12 species mostly tropical American; one Japanese; one Indo-Chinese.

DENDROPANAX MAINGAYI, new species. A shrub; young branches with corky bark, pale-brown when dry, all parts except the umbels glabrous. *Leaves* alternate or sub-opposite, thinly coriaceous, oblong-ovate, oblong or lanceolate, acute; the base rounded, sometimes slightly narrowed; the edges entire and slightly recurved when dry; both surfaces glabrous, dull, the midrib prominent on the lower and sending off near its base two bold curving nerves running at some distance from the margin to the apex and, above the origin of these, 7-8 pairs of faint horizontal nerves; length 2-3.25 in., breadth 1-1.75 in., petioles varying from .25-1.5 in. in length. *Umbel* simple, terminal, its pedicel .35-.5 in. long; flowers 8-12, oblong, pedicelled, .2 in. long, their pedicels .25-.4 in. long. *Calyx* cylindric-campanulate, puberulous, its mouth with 5 sharp triangular teeth. *Petals* broadly lanceolate, acute, quite free. *Fruit* globular, succulent, glabrous, .3 in. in diam. *D. parviflorum*, Clarke in Hook. fil. Flor. Br. Ind. (not of *Bentham*).

MALACCA; *Maingay* (Kew Distrib.) 682; *Griffith* 2685-1. PERAK; *Scortechini* 308.

This *Dendropanax*, found in Malacca and Perak, does not agree with specimens of *D. parviflorum*, Benth., collected in Hongkong. It appears to me to be a distinct species hitherto un-named.

## 6. ARTHROPHYLLUM, Blume.

Shrubs or small trees, unarmed. *Leaves* glabrous or sub-glabrous, the lower large and compoundly pinnate, the uppermost opposite and simple, the intermediate 3-foliolate; leaflets easily separable from the rachis; stipules forming a ligule within the petiole. *Inflorescence* a terminal compound umbel, the terminal umbellules peduncled; bracts very small; pedicel not jointed under the flower. *Calyx-teeth* 5, small. *Petals* 5, valvate. *Stamens* 5. *Ovary* 1-celled, 1-ovuled; style short, simple. *Fruit* (in the Indian species) ovoid, not angular. *Seed* sub-globose; albumen ruminant. **DISTRIB.** Species 3, Malayan.

The 1-celled ovary is anomalous in this Order, and this genus was excluded from *Araliaciæ* by Seemann.

- |   |     |     |                              |
|---|-----|-----|------------------------------|
| Lower leaves pinnately decomposed                 | ... | ... | 1. <i>A. diversifolium</i> . |
| Lower leaves simply pinnate, or at most bipinnate | ... | ... | 2. <i>A. pinnatum</i> .      |

1. ARTHROPHYLLUM DIVERSIFOLIUM, Blume Bijdr. 879. A shrub or small tree, all parts except the umbels glabrous. Lower leaves large, pinnately decomposed, with pairs of opposite leaflets at the main divisions, the upper leaves smaller and simply pinnate, and the uppermost of all trifoliolate or simple; leaflets coriaceous, oblong or elliptic, acute, narrowed at the base, entire; length 1.5–3 in., breadth 1.25–2.25 in.; petiolules .25–.45 in., slender. *Inflorescence* a compound umbel; the peduncles of the ultimate umbels unequal, covered with warm brown deciduous stellate tomentum; lengthening in fruit to .5–1.5 in.; pedicels .25 in. long; *fruit* ovoid-globose, not ridged, crowned by the conical disc, glabrous. Clarke in Hook. fil. Flor. Br. Ind. II, 734; Miq. Flor. Ind. Bat. I, Pt. I, 767. *A. javanicum*, Blume Bijdr. 879; DC. Prodr. IV, 266; Kurz For. Flor. I, 540. *A. ellipticum*, Blume and DC. l. c. *A. Blumeanum*, Zoll. & Mor. Verz. 41; Miq. l. c. 1, 768. *A. ovalifolium*, Jungh. & De Vriese in Miq. l. c. t. 14. *Panax polycarpum*, Wall. Cat. 4930. *P. Jackianum*, Wall. Cat. 4931. *Hedera Jackiana*, G. Don Gen. Syst. III, 394. *H. ? ovata*, Wall. Cat. 4911. *Eupteron*, sp. nov. Kurz Andam. Rep. Suppl. B 9.

MALACCA; *Griffith* (Kew Distrib. 2675). SINGAPORE; *Anderson* 48, 185; *Hullett* 351, 393; *Ridley*, 5838. PENANG; *Curtis* 781. PERAK *Wray* 2012, 3063; *King's Collector* and *Scortechini*, many numbers. ANDAMAN ISLANDS; *Kurz*.

2. ARTHROPHYLLUM PINNATUM, Clarke in Hook. fil. Flor. Br. Ind. II, 734. A bush; all parts glabrous. *Leaves* pinnate, rarely bipinnate or simple; the pinnate ones 12–18 in. long and with 5–17 leaflets; leaflets varying in size, coriaceous, lanceolate, caudate-acuminate, tapering to the base; the edges entire, glabrous; length 1.25–4 in., breadth .4–1 in., petiolule absent or only .1 in. in length. *Umbels* with few

umbellules, their peduncles 1·5–2 in. long; pedicels glabrous or with rusty stellate deciduous pubescence; fruit sub-globose, shining, ·15 in. in diam. *Panax pinnatum*, Lamk. Dict. II, 715; DC. Prodr. IV, 254; Wall. Cat. 9057. *P. secunda*, Schultz Syst. VI, 215. *Nothopanax? pinnatum*, Miq. Flor. Ind. Bat. I, Pt. I, 766.

PENANG; *Wallich*, *Maingay* (Kew Distrib.) 679. MALACCA; *Main-gay* 677; *Griffith* (Kew Distrib.) 2676; *Ridley* 3224. PERAK; *Wray* 330, 1475; *Scortechini* 352.

#### 7. WARDENIA, new genus.

A miniature tree with prickly stem, otherwise unarmed. *Leaves* coriaceous, simple, on long terete petioles expanded at the base into a short sheath with 2 minute stipules on its inner surface. *Inflorescence* a terminal shortly-branched compound umbel. *Flowers* hermaphrodite. *Calyx-tube* narrowly campanulate, its limb with 5, small, spreading teeth. *Petals* 5, calyptrate, their edges slightly infolded, valvate below, slightly imbricate near the apex; the midribs prominent on the inner surface. *Stamens* 5, alternate with the petals; the filaments short, straight; the *anthers* versatile; the cells linear, quite separate from each other, each united by its middle to the tip of the filament. *Disc* large, fleshy, convex, covering the whole of the apex of the ovary, slightly 5-lobed. *Styles* united to form a short thick column without any distinct stigmatic enlargement; ovary 1-celled, with 2 parallel pendulous ovules. *Fruit* 2-celled, by the formation of a dissepiment not present in the ovary, 2-seeded; *seeds* compressed. A single species.

This genus is allied to *Arthrophyllum*; but its ovaries, although one-celled, have two pendulous ovules. The fruit, however, is two-celled, by the subsequent formation of a dissepiment, and is 2-seeded. The leaves moreover are all simple. The seeds of the few specimens which I have seen are quite young and the nature of the albumen cannot be made out. I have named the genus in honour of my friend Brigade-Surgeon Lt.-Colonel C. J. H. Warden, a distinguished pharmacologist and one of the authors of the *Pharmacographia Indica*.

WARDENIA SIMPLEX, King. A shrub 6–8 in. high, deciduously rufous-pubescent towards the apex, prickly near the base. *Leaves* simple, elliptic, tapering gradually to the shortly acuminate apex, not narrowed to the slightly cordate base; both surfaces bearing minute scattered rusty stellate hairs; length 8–15 in., breadth 3·5–7 in., petiole 5–10 in. *Flower* buds ·1 in. in diam., conical; pedicels ·6–·9 in. long, slender, rusty-pubescent, the umbels 10–20-flowered. *Calyx* slightly rusty-pubescent. *Petals* glabrous. *Fruit* elliptic-globose, sub-glabrous, ·2 in. long, crowned by the calyx and by the slender conic stylar column.



PERAK; near Ulu Kerling, *King's Collector* in flower during March only once collected.

### 8. HETEROPANAX, Seem.

A small unarmed tree. *Leaves* glabrous or nearly so, very large, pinnately decomposed, stipules not prominent. *Panicles* large, the branches bearing umbels, stellate-hairy; bracts of umbels small, ovate, obtuse, persistent; pedicels not jointed to the flowers. *Flowers* polygamous, the female flowers most numerous in the terminal umbel. *Calyx-lobes* minutely toothed. *Petals* 5, valvate. *Stamens* 5, filaments filiform, anthers ovate. *Disk* nearly flat; ovary 2-celled; styles 2, slender, free from the base, spreading, the stigmas sub-terminal. *Fruit* laterally compressed, coriaceous, almost didymous, 2-seeded. *Seeds* compressed, albumen ruminant. Species 1 or 2; Indo-Chinese.

HETEROPANAX FRAGRANS, Seem. Rev. Hed. 73. A tree 40–60 feet high; all parts glabrous. *Leaves* large, the lower often 3 feet across, pinnately decomposed, the pinnae with a pair of opposite leaflets at their forks; leaflets ovate or ovate-oblong, acute or acuminate; the base slightly oblique, not narrowed; variable in size (2·5–5 in. long, and 1·5–2·5 in. broad); petiolules of lateral leaflets 1–2 in. long, that of the terminal one 8–1 in. *Panicles* terminal, longer than the leaves; *flowers* small, whitish-tomentose, in small condensed umbels, their pedicels under 25 in. long; *fruit* compressed, sub-reniform, sub-glabrous, slightly glaucous, 35 in. across. Brandis For. Flora 249 Kurz For. Flora Burma, I, 541; Clarke in Hook. fil. Flor. Br. Ind. II, 734. *Panax fragrans*, Roxb. Hort. Beng. 21; Flor. Ind. II, 76; Wall. Cat. 4929; DC. Prodr. IV, 254 (*excl. syn. of Don*).

ANDAMAN ISLANDS; *King's Collector*. **DISTRIB.** Brit. India, Java, China.

### 9. BRASSAIOPSIS, Decne. & Planch.

Large shrubs or trees, glabrous or tomentose, armed or not. *Leaves* digitate or palmate or angled; stipules connate within the petiole, not prominent. *Umbels* in large compound panicles, young parts at least stellately tomentose; bracts not large, often persistent; pedicels rising from a dense cluster of persistent bracteoles, not jointed under the often polygamous flowers. *Calyx* 5-toothed. *Petals* 5, valvate. *Stamens* 5. *Ovary* 2-celled; styles 2, united, long or short. *Fruit* broadly globose or turbinate, 2- or (by abortion) 1-seeded. *Seed* not compressed; albumen ruminant. **DISTRIB.** Species 11; Northern Brit. India to Java.

BRASSAIOPSIS PALMATA, Kurz in Journ. As. Soc. Beng. XXXIX

(1870) Pt. II, 77. A small sparingly prickly tree with simple stem slightly branched near the top; young shoots covered with tawny or rusty scurfy tomentum. *Leaves* crowded at the ends of the stem and branches, large, 9–15 in. across, coriaceous, rotund in general outline, cordate at the base, palmately lobed about half or more than half way down; the lobes 5–9, oblong, or sometimes sinuate towards the base, acuminate, serrate; upper surface glabrous, lower sub-glabrous; the petiole 10–20 in. long, without prickles, scurfy-tomentose when young, ultimately glabrous. *Inflorescence* rusty-tomentose, terminal, paniced, the ultimate branches bearing many-flowered bracteolate umbels; flowers 1.5 in. across, their pedicels .5–.7 in. long; rim of calyx narrow, irregularly toothed. *Fruit* broadly elliptic or turbinate, terete, .3 in. long, as large as a pea, crowned by the slender column of connate styles; cocci 1 or 2, with chartaceous pericarp, 1-seeded. Kurz For. Flor. Burma I, 537; Clarke in Hook. fil. Flor. Br. Ind. II, 735. *Panax pulmatum*, Roxb. Hort. Beng. 21; Flor. Ind. II, 74. *Hedera polycantha*, Wall. Pl. As. Rar. II, t. 190; Cat. 4907 B.

This species is closely allied to *B. Hainla*, Seem., from which it differs chiefly in having leaves with deeper narrower more serrate lobes, and also in having rusty instead of pale tomentum on the young shoots and inflorescence. The two are in my opinion rather too closely allied to be kept distinct as species. In his distribution, Wallich issued both under the name *Hedera polycantha* and the number 4907.

PERAK; *Scortechini* 17, 146; *Ridley* 3018; *King's Collector* 2598. **DISTRIB.** Brit. India, along the base of the Himalaya; Assam and Burma.

VAR. *andamanica*, lobes of leaves obovate-oblong, the edges almost entire; inflorescence a narrow panicle nearly as long as the leaves. *Araliopsis andamanica*, Kurz in Andaman Report, App. B, 9.

ANDAMAN ISLANDS; *Kurz*, *King's Collectors*.

#### 10. HEDEROPSIS, C. B. Clarke.

A glabrous unarmed tree. *Leaves* 1–3-foliolate; leaflets lanceolate, denticulate or nearly entire; base of petiole much dilated; stipules inconspicuous. *Umbels* paniced; bracts and bracteoles deciduous; pedicels jointed close under the flowers. *Calyx* margined, somewhat prominently 5-toothed. *Petals* 5, valvate. *Stamens* 5. *Ovary* 5-celled; styles connate. *Fruit* berried, large, sub-globose, crowned by the stout persistent style. *Seeds* 5–4; albumen ruminated.

HEDEROPSIS MAINGAYI, Clarke in Hook. fil. Flor. Br. India, II, 739. Leaflets of the compound leaves membranous, ovate-lanceolate, acuminate, narrowed at the base, nerves faint, length 3–5 in., breadth 1.5–2

in., petiolules 1-2 in. Simple leaves as long as 8.5 in. and about 4 in. broad; petiole 1-2 inches. *Inflorescence* a panicle of umbels with puberulous peduncles 1 in. or more long. *Calyx-tube* sub-globular, puberulous. *Petals* ovate-lanceolate, spreading, .15 in. long. *Fruit* (unripe) more than .5 in. long, including the conical disc and persistent style.

MALACCA; *Maingay* (Kew Distrib.) 683.

This plant has not been collected since Maingay's time, and it is known only from his fragmentary specimens.

#### 11. TUPIDANTHUS, H. f. & T.

A large glabrous shrub, at first erect but afterwards a lofty climber. *Leaves* digitate; leaflets glabrous, leathery, entire; stipules connate within the petiole. *Inflorescence* a compound umbel or small panicle; pedicels thick, not jointed under the flowers. *Calyx-margin* obsolete. *Petals* closely connate, falling off in a cap. *Stamens* very many, in two or several series. *Ovarian* cells and stigmas very numerous; the latter sessile, radiating, crowded but not connate. *Fruit* globose, depressed, succulent.

TUPIDANTHUS CALYPTRATUS, Hook. fil. and Thoms. in Bot. Mag. t. 4908. *Leaflets* 7-9, oblong or oblong-obovate, acute or blunt, 4-7 in. long, and 1.75-3.5 in. broad, the petiolules 1-2 in.; the common petiole 6-15 in. *Inflorescence* umbellate, 3-4-branched; the branches stout, short and with large coriaceous bracts at their bases; the ultimate umbels with 3-7 pedicellate flowers nearly 1 in. across; calyx-tube glabrous, thickly coriaceous. *Stamens* 50-70, crowded. *Fruit* sub-globose, succulent, 1.25-1.5 in. in diam. when ripe. Seem. Rev. Hed. 6; Clarke in Hook. fil. Flor.Br. Ind. II, 740.

PERAK; on Gunong Ulu Sungei, elevat. 4500 feet; *Wray* 1594. DISTRIB. Burma; Khasia Hills and probably Java.

Mr. Wray's specimens were collected at an elevation much higher than this species ever ascends to in British India. They have smaller leaves with blunt leaflets, but are otherwise indistinguishable from the British Indian plant.

*Note on the Seasonal change of Plumage in the males of the Purple Honey sucker (Arachnechthra asiatica) and of an analogous American bird (Coereba cyanea).—By F. FINN, B.A., F.Z.S., Deputy Superintendent, Indian Museum.*

[Received and Read January 4th, 1898.]

Dr. Jerdon in his "Birds of India" (Vol I, p. 370) and Captain Shelley, in his Monograph of the *Cinnyridae*, agree in assigning to the male of our common Purple Honey sucker (*Arachnechthra asiatica*) besides its characteristic dress, a plumage much resembling that of the female, but marked with a broad purple streak down the ventral surface. Dr H. Gadow, however, in the British Museum Catalogue volume (IX, p. 58), dealing with these birds, ignores this change of plumage; and Mr. Oates, in his "Birds of British Burmah" (Vol. I, p. 322), states that the change does not take place in that country, "for full-plumaged males may be obtained all the year round." He believes also that the young males of this species are clothed in female plumage all through their first winter, and thinks that the abundance of such has probably given rise to the belief in a change of plumage.

With all due deference to the opinion of so excellent an ornithologist as Mr. Oates, however, I venture to suggest that he is wrong, and that the authors previously cited are right, with respect to this change of plumage, at any rate in Indian examples.

In the first place, the presence of full-plumaged birds all the year round is of very little weight in disproving this change. Marked individual variations occur in the period of change of plumage by birds which possess more than one dress, and specimens of such species may be found in more or less full-plumage and undress at the same date, as I have myself seen in Ducks and Dabchicks.

This consideration disposes, I think, of Mr. Oates' first argument, but I have better evidence to bring forward.

About the middle of July last year (1897) in view of my approaching visit to England on leave, I procured a number of Honey suckers in the hope of being able to take some alive to the London Zoological Gardens, where such birds have never previously been exhibited. All the birds I kept, with one exception, were *Arachnechthra zeylonica*, but I had, and brought home safely, one male specimen of the species I am now considering.

This bird, when I got it, was in heavy moult, and mostly purple in colour, but to my great surprise (I had taken it for a young male assuming full-plumage) it gradually lost this hue, and by the time I

started for England, in the first week in August, it was in the non-breeding dress, brown above and yellow below, with the median purple streak, but still retaining the orange axillary tufts.

This specimen, unfortunately, only survived its advent at the Zoological Gardens for about a fortnight\* and I do not know whether it was preserved; if it was, it was probably put in spirit, as the moult had never been properly completed, and so the plumage was in bad order. It had, however, lived long enough to show that the change above referred to does really take place; for that captivity could have so affected the bird as to change the colour of the actually growing feathers, I am not inclined to admit, and I therefore conclude that the accounts which give this bird a change of plumage are quite correct.

While on this subject, it seemed to me that I might draw the attention of ornithologists to a similar change, apparently hitherto unrecorded, in a bird which, though not believed to be allied to our Sunbirds, and inhabiting the New World, nevertheless in form and habits presents at least an analogical resemblance to these. I allude to the Yellow-winged Blue Sugar-bird (*Coereba cyanea*) of which several specimens have been exhibited in the London Zoological Society's Gardens.

During my previous acquaintance with the species there, I had been struck by the change of plumage that the male appeared to undergo, and when in England last September, I found the Society's single specimen, a male which had been acquired as long ago as 1890, actually passing into the full violet plumage from the undress stage, which had been olive-green above, and yellowish below, much resembling the coloration of the female. The tail was black, and the wings yellow and black, and the legs pink-red, as in the male in full plumage. In fact,

\* I ascribe my small measure of success with living Sunbirds to the fact that I fed them too much on "slops" — sweetened milk or milk-sop. In addition to some such food given at first it would, I think, be well to supply crumbled yolk of hard-boiled egg mixed with powdered sugar, and to keep them as much on this as possible, with fruit also. None of the *Arachnechtra zeylonica* I had survived the voyage but one, and this died in the train *en route* from Plymouth to London. I saw this bird bullying the *A. asiatica* one occasion at least, and I had previously noticed that the latter bird appeared somewhat to fear its companions. When all were together in a big cage in Calcutta it kept almost entirely to one twig in the branch put in this cage, and was in general less active in its movements than *A. zeylonica*, though it seemed less sensitive to cold on the voyage. None of the male *A. zeylonica*, some of which were moulting, showed any sign of changing their bright plumage for a duller one, as suggested by Captain Shelley in his account of the species in the Monograph above quoted. Neither did they molest each other, while I remember having had to separate two male specimens of *A. asiatica* which I had previously kept, because one was getting so badly bullied by the other.

F. F.

the bird presented much the same appearance as a skin (21280 in Register, exhibited on this occasion) in the Museum collection, except that there were many more violet feathers visible.

The keepers I consulted bore me out as to the regular occurrence of the change of plumage in the male of this species; and one was of the opinion that the quills and tail changed also; but this I do not recollect seeing myself. Unfortunately this bird also soon after died, and was not preserved.

The existence of this change of colouration in the male of a *Coereba* is interesting as tending to confirm the views of those naturalists (Dr. Sclater and Messrs. Baird, Brewer and Ridgway), who place the *Coerebidae* in close connection with the Tanagers, in which group the male of *Pyrranga rubra* exhibits a similar seasonal alteration of plumage.



*Note on the Long-Snouted Whip-Snake (Dryophis mycterizans).—By F. FINN, B.A., F.Z.S., Deputy Superintendent, Indian Museum.*

[Received and Read, January 5th, 1898.]

A common belief in India accredits the Whip-Snake with the propensity for deliberately striking at the eye. As this trait is not alluded to by either Dr. Günther or Dr. Boulenger in their accounts of the Indian Reptilia, I venture here to bring forward an instance which shows that the notion above noticed is really correct.

On December 1st, 1897, a bird-catcher, with whom I had previously had dealings, brought to my quarters two specimens of the Long-Snouted Whip-Snake (*Dryophis mycterizans*) for sale. Knowing them to be harmless, and the vendor having no fear of them, I took both in my hands and went to show them to a friend who was in an adjoining room; the larger one\* having meanwhile struck at my hand, without breaking the skin. As I was exhibiting the snakes, I was rather unpleasantly surprised by finding this large specimen suddenly dart at my eye, and inflict a bite on it, which, as I had instinctively closed the threatened organ, only resulted in some small punctures on the eyelids, which were just sufficient to draw a little blood. The position of these, two on the upper, and one on the lower eyelid, sufficiently shows, I think, the deliberateness of the reptile's aim. Of course I suffered no inconvenience from the bite, although on rubbing my eye

\* This stuffed skin of this specimen was exhibited, together with a sketch of the bitten eye made by the Museum artist, to show the position of the tooth-marks.

a few hours afterwards, I removed a tooth rather over  $\frac{1}{20}$  inch long from the puncture in the lower eyelid. This, however, after being examined under the microscope by Dr. Alcock and myself, proved not to be a grooved one, so that this little experience throws no light on the possible effects of *Dryophis* fangs on the human subject; I think, however, that it may be fairly allowed, in connection with the belief above mentioned, to upset the reputation for gentleness which Dr. Boulenger awards to the species.\* I may say that I was not holding the snake roughly or maltreating it in any way, and that when confined afterwards in a glass case it repeatedly struck at anyone who came near, seeming to aim particularly at the face, though it soon recognized, apparently, the futility of attacking glass.

This intelligence in attack was again shown subsequently, when, having transferred the snake to a large cage of wire gauze, I endeavoured to make it attack a Gecko. This it would not do even when the lizard was thrown absolutely in its face, darting open-mouthed at me instead. It similarly refused to bite a handkerchief with which I teased it, though I have succeeded in getting *Dendrophis pictus* (a black Andaman variety) to do this.



*Materials for a Carcinological Fauna of India. No. 3. The Brachyura Cyclometopa. Part I. The Family Xanthidæ.—By A. ALCOCK, M.B., C.M.Z.S., Superintendent of the Indian Museum.*

[Received 20th March. Read 6th April, 1898.]

The family *Xanthidæ*, as here defined, includes the *Canceridæ* (without *Cancer* and *Pirimela*) and the *Eriphiidæ* (without *Oethra*) of Dana's system.

It is a family which, as most authors have remarked, it is almost impossible to divide into groups that shall be at once natural and sharply defined, owing to the numerous intergradations of form that exist.

The Indian species of this family, so far as I have been able to discover, number 153, of which all but the following 14 are represented in the Indian Museum:—

*Carpilodes venosus* Edw., *Carpilodes margaritatus* A. M. Edw., *Lachnopus rodgersi* Stimpson, *Lophactæa fissa* Henderson, *Lophozozymus*

\* I hope this will not be taken as captious criticism of Dr. Boulenger's work, for which I entertain the sincerest admiration, especially since I know that gentleman to be in the habit of studying reptiles in life when opportunity offers.

*cristatus* A. M. Edw., *Hypocoelus rugosus* Henderson, *Cycloxanthus lineatus* A. M. Edw., *Halimede thurstoni* Henderson, *Cymo tuberculatus* Ortmann, *Pilumnus labyrinthicus* Miers, *Actumnus verrucosus* Henderson, *Actumnus nudus* A. M. Edw., *Heteropanope eucratoides* Stimpson, *Eurycarcinus maculatus* A. M. Edw.

The new species described in this paper have almost all been obtained by the "Investigator" and will be figured in the *Illustrations of the Zoology of the Investigator* for the year 1899, the original drawings for which are now in course of preparation.

### Tribe CYCLOMETOPA.

*Cyclométopes* Milne Edwards, Hist. Nat. Crust. I. 264, 363 (*part.*)

*Cancroidea*, Dana, U. S. Expl. Exp. Crust. pt. I. p. 142 (*part.*)

*Cyclométopes*, A. Milne Edwards, Ann. Sci. Nat., Zool., (4) XIV. 1860, p. 183.

*Cyclometopa* or *Cancroidea*, Miers, Challenger Brachyura, p. 106 (*part.*)

*Cancroidea Portuninea* and *Cancroidea Cyclometopa* (*part.*) Ortmann, Zool. Jahrb., Syst., VII. 1893-94, pp. 65 and 411.

Carapace, almost without exception, broader than long, the antero-lateral borders generally arched, sometimes very strongly so, the postero-lateral borders generally convergent, sometimes very strongly so: the front broadish or broad, horizontal or obliquely deflexed, not rostrate.

Buccal cavern square-cut, commonly broader than long: the palp of the external maxillipeds articulating at or near the antero-internal angle of the merus.

Epistome transverse, short fore and aft.

The antennules generally fold nearly transversely.

The abdomen of the male occupies all the space between the last pair of legs.

Branchiæ nine pairs; their efferent channels opening on either side of the palate.

The genital ducts of the male open at the bases of the last pair of legs.

The *Cyclométopes* of Milne Edwards includes the genus *Ethra* which, following Miers, has been relegated to the Oxyrhynga in this series of papers, and excludes the *Telphusidæ*, which by all subsequent writers have been regarded as true *Cyclometopes*.

The *Cancroidea* of Dana includes the genus *Acanthocyclus*. My only knowledge of this genus is derived from drawings and descriptions, which do not as yet satisfy me that *Acanthocyclus* is more nearly related to the *Cyclometopes* than to other groups.

The *Cyclometopa* of Miers includes not only *Acanthocyclus*, but,



following Claus, the *Corystoidea*. Now undoubtedly several of the forms included under the *Corystoidea* have very close relations with *Cancer* and *Pirimela*; and if *Cancer* and *Pirimela* are regarded as typical Catametopes then such (*Corystoid*) forms as *Atelecyclus* and *Hypopeltarium* may also be classed as Cyclometopes.

In this preliminary paper I prefer not to take *Cancer* as an ideal Cyclometope, and to leave the *Corystoidea* for future consideration.

The *Oyclometopa* of Ortmann includes the family *Parthenopidæ*, which in this series of papers has, in accordance with the views of other authors, been considered with the *Oxyrhyncha*; and also the *Corystoid* genera *Atelecyclus* and *Hypopeltarium*, the Cancrine affinities of which have been admitted. I cannot, however, think that the removal of the *Parthenopidæ* from their long approved position, as *Oxyrhynchs* showing a connexion between that type and the Cancrine type, serves any useful purpose.

For the purposes of this paper the *Cyclometopa* are divided into the following families:—

I. *Cancridæ*, in which the fold of the antennules is longitudinal or obliquely longitudinal, and the anterior boundary of the buccal cavern is somewhat indefinite, being more or less overlapped by the external maxillipeds.

Of this family, of which *Cancer* and *Pirimela* are types, no representative is known in the Indian Seas.

II. *Xanthidæ*, in which the fold of the antennules is transverse or obliquely transverse, and the anterior boundary of the buccal cavern is raised and sharply defined, so that the external maxillipeds commonly shut close against it unless they fall short of it.

III. *Portunidæ*, in which the fifth pair of legs is peculiarly modified for swimming and usually has the propodite and dactylus singularly broad thin and paddle-like.

IV. *Telphusidæ*, in which the form is Grapsoid, the branchial regions being much dilated. The members of this family inhabit fresh water and, sometimes, damp jungle.

The present paper refers to the family *Xanthidæ*.

#### Family XANTHIDÆ.

*Canceriens arqués et quadrilatères* Milne Edwards, Hist. Nat. Crust. I. 369.

*Cancridæ* (exc. *Cancrinæ* et ?*Polydectinæ*) and *Eriphidæ* (exc. *Oethrinæ*) Dana, U. S. Expl. Exp., Crust., pt. I. pp. 147, 228.

*Canceriens* (exc. *Oethra*, *Cancérides* et *Pirimélides*) A. Milne Edwards, Nouv. Archiv. du Mus. I. 1863, pp. 177-182.

*Cancridæ* (exc. *Cancer*), Miers, Challenger Brachyura, p. 106.

*Xanthini* (exc. *Thiidæ*), Ortmann, Zool. Jahrb. Syst. VII. 1893-94, p. 412.

Carapace transversely oval or transversely hexagonal or subquadrate or (rarely) subcircular, but almost always broader than long. Front broadish or very broad, never in the form of a rostrum. The fold of the antennules is transverse or obliquely transverse. Antennary flagella short or slender. Anterior margin of buccal cavern very well defined, not overlapped by the external maxillipeds. Legs gressorial.

The *Xanthidæ* may be divided, according to the character of the palate emphasized by Dana, into two sections, as follows:—

I. *Hyperomerista*, in which the efferent branchial channel on either side is defined by a ridge on either side of the palate,—the ridge extending right up to the anterior border of the buccal cavern.

II. *Hyperolissa*, in which ridges defining the efferent branchial channels are either altogether absent or are present on the posterior part of the palate only.

I do not think that these sections, depending on a single variable character, should be considered as families, or even as subfamilies.

The section *Hyperolissa*, which corresponds to Dana's family *Cancridæ*, minus *Cancer* and *Pirimela* and *Polydectus*, is here subdivided into 3 subfamilies, hereafter characterized, namely, *Xanthinæ*, *Actæinæ*, and *Chlorodinæ*.

The section *Hyperomerista*, which corresponds to Dana's family *Eriphiidæ*, minus *Oethra*, is here subdivided into 4 subfamilies, hereafter characterized, namely, *Menippinæ*, *Oziinæ*, *Pilumninæ* and *Eriphiinæ*.

The genus *Platypilumnus*, Wood-Mason MS., Alcock, Ann. Mag. Nat. Hist. May 1894, p. 401, and Illustrations of the Zoology of the Investigator, Crustacea pl. xiv. fig. 6, probably belongs to this family and to the section *Hyperolissa*, and is probably related most nearly to *Galene*; but as I have only a single female specimen to go by its exact position must remain undecided.

The following artificial key is meant to serve for the discrimination of the Indian genera of this family:—

*Key to the Indian Genera of the Family Xanthidæ.*

I. The ridges that define the efferent branchial channels, if present, are low and are confined to the posterior part of the endostome, never reaching to the anterior boundary of the buccal cavern :—

- i. The front and the antero-lateral borders together form a strongly convex arch ; the postero-lateral borders markedly, and often very strongly, convergent ; the posterior border, in consequence, short :—
- 1. Fronto-orbital border hardly ever (in adults) more than half, most usually much less than half, the greatest width of the carapace :—

A. Carapace convex both fore and aft and from side to side across the branchial regions :—

a. The abdomen of the male consists of seven distinct movable segments, the last of which is more than twice as long as the last but one :—

x. Front *very* narrow and prominent, shaped like a pair of human incisors :  
carapace smooth .....

y. Front square-cut, narrow, the two lobes not strongly convex dorsally :  
carapace rugose and granular .....

b. The abdomen of the male consists of five or six segments, owing to fusion of some, and the last is about the same length as the last but one :—

x. A deep notch in the anterior border of the merus of the external maxillipeds (abdomen of male with the 7 segments distinct, but the 3rd, 4th and 5th move together) .....

y. No deep notch in the anterior border of the merus of the external maxillipeds :—

p. A large oval or reniform cavity in either pterygostomial region ..

q. No cavity in the pterygostomial regions :—

1. Antero-lateral borders of carapace sharp, crest-like :  
upper border at least of arms, and of meropodites  
carpodites and propodites of legs sharp and crest-  
like : basal antennal joint short, touching or clasping  
the turned down side-edge of the front ; chelipeds  
equal :—

\* Crest of antero-lateral border entire or slightly  
notched ; carapace strongly convex in both direc-  
tions ; fingers sharp pointed :—

† Carapace perfectly smooth with the regions  
either not at all or only vaguely indicated ...

† Regions and subregions of carapace well  
sculptured, often granular .....

POLYCHEMUS.

HALIMEDE.

DÀIRA.

HYPOCELIUS.

ATEGATIS.

LOPHACTEA.

9. 1. (*continued*). [Antero-lateral borders sharp and crest-like; upper border of meropodites crest-like]:—  
 \* Crest of antero-lateral border cut into four sharp lobes; carapace moderately convex, its regions much areolated; fingers blunt, hollowed out at tip.....
- ZOZYMUS.
2. Antero-lateral borders not cristiform, cut into several strong teeth: either the upper and lower inner angles of the orbit are in contact, or the outer angle of the basal antennal joint is prolonged into and completely fills the orbital hiatus:—  
 \* Antero-lateral borders prolonged beneath the orbits to the angles of the buccal cavern; chelipeds short, hands light and narrow, fingers pointed.....  
 \* Antero-lateral borders normal; chelipeds long, hands very massive, fingers with broad hollowed-out (hoof-like) extremities.....
- EUXANTHUS.
3. Antero-lateral borders not cristiform; the basal antennal joint runs up between the side-edge of the front and the orbital plate, but not into the orbital hiatus; front never deeply cleft into two lobes:—  
 \* Antero-lateral borders entire up to a strong lateral epibranchial tooth; carapace perfectly smooth, without trace of regions; chelipeds unequal, fingers pointed: front three-lobed, the middle lobe prominent with a concave edge.....  
 \* Antero-lateral borders divided into four broad, shallow, rounded lobes; regions and sub-regions of the carapace well demarcated; chelipeds equal, fingers somewhat hollowed at tip; front rather prominent, somewhat convex, grooved and slightly notched in the middle line.....
- ETISUS.
4. Antero-lateral borders not cristiform, divided into four broad, blunt, shallow lobes, of which the first two are almost confluent; basal antennal joint simply touching the front:—  
 \* Carapace nearly twice as broad as long, barrel-like; legs smooth.....
- CARPILIUS.
- CARPILODES.
- LIOMERA.

- \* Length of carapace much more than half its breadth; upper border of meropodites of legs spiny.....
- 5. Antero-lateral borders divided into four more or less distinct lobes; regions of carapace usually profusely areolated and granular; front usually deeply and rather broadly cleft into two pointed rounded lobes: fronto-orbital border sometimes more than half the greatest width of the carapace:—
  - \* Fingers of ordinary form .....
  - \* Fingers compressed and very sharp, like blades of shears .....

LACHNOPODES.

ACTAEA, *part.*

BANAREIA.

ETISODES.

MEDÆUS.

LOPHOZOZYMUS.

HOPLOXANTHUS.

- B. Carapace more or less convex fore and aft, at any rate in its anterior two-thirds, flat from side to side across the branchial regions:—
  - a. Basal antennal joint prolonged into the orbital hiatus: carapace three-fourths as long as broad: fingers hollowed out at tip .....
  - b. Basal antennal joint simply touching the front:—
    - ♂. Carapace three-fourths as long as broad, its antero-lateral border very distinctly prolonged beneath the orbit to the angle of the buccal cavern.....
    - ♀. Length of carapace usually less than three-fourths the breadth, the antero-lateral border not prolonged beneath the orbit to the angle of the buccal cavern:—
      - ♂. Antero-lateral border thin sharp, almost crest-like, either divided into 4 large triangular teeth or quite crest-like and only faintly notched: fingers not hollowed at tip:—
        - \* Antero-lateral borders divided into 4 large triangular teeth: 3rd—5th abdominal terga of the male fused together with or without obliteration of sutures .....
        - \* Antero-lateral borders ending, in one or both sexes, in a strong horizontal lateral epibranchial spine: all 7 abdominal segments distinct .....
      - ♀. Antero-lateral border not crest-like, divided into lobes or teeth which in some cases are indistinct—especially the first two of them:—
        - \* Fingers sharp-pointed, not hollowed at tip, antero-lateral border divided into 3 or 4 (usually 4) lobes or teeth:—

\* Fingers sharp-pointed, not hollowed (*continued.*)

† Regions and subregions of carapace well defined, the lobes or teeth of the antero-lateral border very distinct :—

π. Either the front is sublammellar square-cut and prominent, or, if not, the carapace is smooth (non-granular) .....

β. Antero-lateral borders very long and strongly arched .....

φ. Front cleft into two round-pointed lobes, carapace granular .....

† Regions, save the gastric, not well defined and areolated: the 3 or 4 lobes of the antero-lateral border inconspicuous or almost obsolete .....

\* Fingers blunt-pointed, hollowed at tip, antero-lateral border divided into 4 or more teeth .....

• Fronto-orbital border much more than half the greatest width of the carapace :—  
A. Carapace roughly hexagonal :—

a. Fingers pointed; basal antennal joint very short, just touching the front .....

b. Fingers hollowed at tip, basal antennal joint of good length :—  
Basal antennal joint running up between the turned down side-edge of the front and the orbital plate, carapace not granular or hairy :—

p. Regions and areolae of carapace few and faint or absent altogether

q. Regions and areolae of carapace well sculptured .....

ψ. Basal antennal joint prolonged into the orbital hiatus, regions and subregions of carapace well defined, granular or hairy, or both :—

p. Carapace less than three-fourths as long as broad .....

q. Carapace more than three-fourths as long as broad .....

B. Carapace sub-circular or elongate-pentagonal, leaving 2 or 3 abdominal terga always uncovered: one cheliped enormously larger than the other .....

Carapace more approaching a quadrilateral shape (the arch of the antero-lateral borders being less convex and not longer than the postero-lateral borders, the convergence of the postero-lateral borders less marked, and the posterior border therefore longer), strongly convex fore and aft, flat from side to side: legs long :—

1. Carapace perfectly smooth, without trace of regions, antero-lateral borders entire .....

2. Carapace more or less granular near the margins, regions defined though somewhat vaguely, antero-lateral border with lobes or teeth; basal antennal joint not reaching the front .....

XANTHO.

CYCLOXANTHUS.

ACTAEA, *part.*

LIOXANTHO.

LEPTODIUS.

XANTHODES.

CHLORODIUS.

PHYMODIUS.

CHLORODOPSIS.

CYCLODIUS.

CYMO.

LIAGORE.

GALENE.

3. Regions well defined, to some extent areolated; antero-lateral borders cut into four sharp teeth: carapace somewhat concave from side to side owing to swelling of the branchial regions above the level of the cardiac region. ....

II. The ridges that define the efferent branchial channels extend to the anterior boundary of the buccal cavern, and are often very strong:—

i. Fronto-orbital borders half or less than half the greatest breadth of the carapace, which is broad and transversely-oval:—

1. The basal antennal joint does not nearly reach the front:—

- A. Carapace convex, the antero-lateral borders longer than the postero-lateral:—
  - a. Front less than a fifth the greatest breadth of the carapace: orbital hiatus open .....
  - b. Front nearly a fourth the greatest breadth of the carapace: no orbital hiatus, the orbit being a completely closed cavity .....
- B. Carapace nearly flat, the antero-lateral borders shorter than the postero-lateral .....

2. Basal-antennal joint broadly in contact with the front:—

A. Antero-lateral border not thin and sharp: dactylus of smaller hand shorter than the lower border of the palm:—

- a. Orbital hiatus open .....
- b. No orbital hiatus, the orbit being a completely closed cavity .....

B. Antero-lateral border remarkably thin and sharp: dactylus of smaller hand as long as the entire lower border of the palm .....

ii. Fronto-orbital border just about two-thirds the greatest breadth of the carapace: antero-lateral borders almost always shorter than the postero-lateral:—

1. The basal antennal joint does not reach, or only just reaches, the front: the orbital hiatus is not closed:—

A. Carapace not tomentose, its regions ill defined, the first lobe of the antero-lateral border is a broad lobe confluent with the outer orbital angle:—

- a. Antero-lateral border cut into 4 teeth:—
  - α. Indications of areolation on the carapace, anteriorly: front bilobed .....
  - γ. Carapace smooth, without any trace of areolæ or regions; front cut straight and square (with a median emargination) .....

- b. Antero-lateral border cut into 3 teeth; branchial regions defined by a strong dorsal bulge; front cut straight and square .....

B. Carapace with regions usually rather well defined and areolated: it and the legs usually, but not always, tomentose:—

- a. Carapace transversely oval, flatish or moderately convex, fairly well areolated .....
- b. Carapace sub-circular with very concave postero-lateral borders, strongly convex, usually strongly areolated .....

- HERETROPANOPE.
- EURYCARCINUS.
- NECTOPANOPE.
- PILUMNUS.
- ACTUMNUS.

- ORPHNOXANTHUS.
- MENIPPE.
- MYOMENIPPE.
- PSEUDOZOIUS.
- OZIUS.
- EURUPPELLIA.
- EPIXANTHUS.

- 2. Basal antennal joint broadly in contact with the front: the orbit is a completely closed cavity: foliaceous process of the 1st maxillipeds with its notched anterior margin prominent beyond the anterior margin of the external maxillipeds .....
- i. Fronto-orbital border much more than two-thirds the greatest breadth of the carapace: the antero-lateral borders meet the postero-lateral at a very wide and inconspicuous angle:—
  - 1. Chelipeds longer and stouter than the legs:—
    - A. Merus of external maxillipeds as long as or longer than broad:—
      - a. Basal antennal joint as broad as long, hardly touching the front: little or nothing is seen of the arm beyond the lateral border of the carapace in repose: the gastric region plainly delimited and areolated .....
      - b. Basal antennal joint slender, not or hardly touching the front: no trace of regions on the smooth polished carapace: at least half of the arm projects beyond the carapace:—
        - z. Carapace flat, or little convex: no orbital hiatus:—
          - p. Chelipeds not very greatly unequal; arm long,  $\frac{3}{4}$  visible beyond the carapace: front lobed or dentate .....
          - q. Chelipeds very markedly unequal; arm short,  $\frac{1}{2}$  visible beyond the carapace: front nearly straight, finely denticulate .....
          - r. Chelipeds subequal; arm very long, the whole of it projecting beyond the carapace: front acutely spinate .....
        - y. Carapace convex: an orbital hiatus present: front broadly bilobed: the whole arm projecting beyond the carapace .....
    - B. Merus of external maxillipeds about twice as broad as long .....
  - 2. Chelipeds shorter and slenderer than the legs .....

Appendix to Hyperolissa?

Endostomial ridges sharp and salient posteriorly, very inconspicuous anteriorly. Carapace hexagonal, very thin, and perfectly flat; the postero-lateral borders longer than the spinate antero-lateral borders, and only moderately convergent; the regions very faintly delimited. Legs long and slender. The basal antennal joint does not nearly reach the front .....

BAPTOZIUS.

ERIPHA.

TRAPEZIA.

TETRALIA.

QUADRELLA.

SPHENOMERUS.

DOMECIA.

MELIA.

PLATYPILUMNUS.



SECTION I. *Hyperolissa.*

*Xanthidæ* in which the efferent branchial channels are not defined by a complete ridge on either side of the palate.

## Subfamily I. XANTHINÆ.

Carapace usually much broader than long, usually transversely oval, sometimes transversely hexagonal. The front is contained from  $3\frac{1}{2}$  to  $5\frac{1}{2}$  times in the greatest breadth of the carapace.

Alliance I. CARPLIOIDA. Carapace broad, transversely oval, the antero-lateral border either entire, or divided into a few broad, shallow, rounded lobes. Legs sub-cylindrical. Abdomen of the male with the 3rd and 4th, or usually the 3rd, 4th and 5th segments fused together.

Alliance II. ZOZYMOIDA. Carapace broad, transversely oval, the antero-lateral border in the form of a sharp crest which may be either thin and entire (fissured only) or cut into 4 large teeth. Legs with at least the upper border of the merus carpus and propodus sharply cristiform. Abdomen of the male with the 3rd, 4th and 5th somites fused.

Alliance III. EUXANTHOIDA. Carapace broad, transversely oval, very profusely areolated in high relief; the antero-lateral borders are continued below the orbits to the outer angle of the buccal cavern. The basal antennal joint has its outer angle prolonged and impacted in the orbital hiatus, and the antennary flagellum, which is hardly visible without a lens, arises within the orbit. The abdomen of the male has the 3rd, 4th and 5th somites fused.

Alliance IV. XANTHOIDA. Front almost always prominent, square-cut (notched or fissured in the middle line) and sublaminar, and almost always separated from either supra-orbital margin by a deepish notch. Carapace broad (except *Medæus* and *Etisodes*), usually transversely oval, but sometimes more hexagonal; the antero-lateral border usually cut into sharp teeth. Male abdomen with segments 3-5 fused.

Alliance V. HALIMEDOIDA. Front prominent and square-cut. Carapace pentagonal, moderately broad. Abdomen of the male with all 7 segments distinct, the last segment being more than twice as long as any of the others.

Alliance VI. GALENOIDA. Carapace broad, pentagonal approaching the quadrilateral, the antero-lateral border hardly longer than the postero-lateral. The basal antennal joint does not nearly reach the front. The abdomen of the male has all 7 segments distinct. The sole type, *Galene*, is so singular that it might be separated as a distinct subfamily.

## Subfamily II. ACTAEINÆ.

Carapace usually much broader than long and usually very profusely and profoundly lobulated; the antero-lateral border is either divided into 4 blunt lobes, or crenated. The front is about a third the greatest breadth of the carapace, sometimes a little more, sometimes a little less, and is divided into two rather prominent usually round-pointed lobes.

## Subfamily III. CHLORODINÆ.

Carapace hexagonal or transversely oval, or subcircular (*Cymo*) or approaching the subcircular (*Cyclodius*). Front from a third to half the greatest breadth of the carapace—much broader than in the preceding subfamilies.

Alliance I. XANTHODEOIDA. Carapace transversely oval, front a third or little less than a third the greatest breadth of the carapace, fingers not hollowed at tip.

Alliance II. CHLORODIOIDA. Carapace transversely oval, front nearer half than a third the greatest breadth of the carapace, fingers hollowed at tip.

Alliance III. CYMOIDA. Carapace subcircular, flat; front about half the greatest breadth of the carapace: chelipeds remarkably unequal.

## Subfamily I. XANTHINÆ.

Alliance I. *Carpilioïda.*

Carpilius.

Liomera.

Liagore.

Carpilodes.

Lioxantho.

Lachnopus.

## CARPILIUS, Leach, Desmarest, A. M. Edw.

*Carpilius*, Leach, Desmarest Consid. Gen. Crust. p. 104 (footnote).

*Carpilius*, Rüppell, 24 Krabben roth. Meer. p. 13 (part).

*Carpilius*, Milne Edwards, Hist. Nat. Crust. I. 380.

*Carpilius*, De Haan, Faun. Japon. Crust. p. 16.

*Carpilius*, Dana, U. S. Expl. Exp. Crust. I. p. 159.

*Carpilius*, A. MILNE EDWARDS, ANN, SCI. NAT. ZOOL. (iv.) XVIII. 1862, p. 46, and NOUV. ARCHIV. DU MUS. I. 1865, p. 212, and Miss. Sci. Mex., Crust. p. 238.

*Carpilius*, Miers, Challenger Brachyura, p. 110.

Carapace broad, very convex in both directions, smooth (except for some coarse pitting inside the frontal and antero-lateral border), with no indication of regions; its antero-lateral borders strongly-arched, thick, entire, smoothly-moulded; its postero-lateral borders strongly-conver-

gent, straight, with a prominent tubercle at the angle of junction with the antero-lateral.

Front moderately broad, (less than a third the greatest width of carapace) deflexed, 3-lobed, the middle lobe prominent and bilobulate, the edges of all thickened.

Orbital margins entire, the upper margin thickened and forming a well-marked blunt tooth at its junction with the antero-lateral margin. Eyes on short thick stalks.

Antennules folding obliquely, almost transversely: inter-antennular septum broad.

Basal joint of antennæ long, flat, running up into an oblique cleft between the margin of the front and the infra-orbital plate; the antennary flagellum very small, less than half the diameter of the orbit and lodged in the said cleft.

Merus of the external maxillipeds with its anterior border very oblique.

Chelipeds massive, smooth, unequal in both sexes; the fingers bluntly pointed, those of the larger cheliped with a single pair of molariform teeth, those of the smaller cheliped with a blunt cutting-edge.

Legs smooth, sub-cylindrical.

Abdomen of male six-jointed—the 3rd and 4th somites fused with obliteration of sutures, the 5th somite also immovably adherent to the 4th. Large crabs.

### *Key to the Indian species of Carpilus.*

- |  |     |                      |
|--|-----|----------------------|
| 1. Carapace with definitely disposed large red blots | ... | <i>C. maculatus.</i> |
| 2. Carapace irregularly marbled with red             | ... | <i>C. convexus.</i>  |

#### 1. *Carpilius maculatus*, (Linn.)

*Cancer ruber*, Rumph, Amboinsche Rariteitkamer, p. 18, pl. x. fig. 1.

*Cancer saxatile*, Seba, Thesaurus, III. 47, pl. xix. fig. 12.

*Cancer maculatus*, Linn. Syst. Nat. (xii.) p. 1042: Fabricius, Ent. Syst. II. 447, and Suppl. p. 338: Herbst, Krabben, I. ii. 135, pl. vi. fig. 41, and I. ii. 263, pl. xxi. fig. 118, and III. iv. 8, pl. lx. fig. 2: Desmarest, Consid. Gen. Crust. p. 104.

*Carpilius maculatus*, Milne Edwards, Hist. Nat. Crust. I. 382, and in Cuvier Règne Animal, Crust. pl. xi. fig. 2: De Haan, Faun. Japon., Crust. p., 7 (name only): Dana, U. S. Expl. Exp., Crust. pt. I. p. 160: Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 32: Alph. Milne Edwards, in Maillard's Pîle Réunion, Annexe F, p. 3, and Nouv. Archiv. du Mus. 1. 1865, p. 214 and IX. 1873, p. 175: Heller, Reise Novara, Crust. p. 9: Hess, Archiv. fur Naturges. XXXI. i. 1865, pp. 133 and 171: Hoffmann, in Pollen and Van Dam, Faun. Madagasc., Crust. p. 3; Richters in Mobius Meeresf. Maurit. p. 145: F. Muller, Verh. Ges. Basel. VIII. 1886, p. 473: Miers, Challenger Brachyura, p. 111: de Man, Archiv. f. Naturges. LIII. 1887, i. p. 231, and Zool.

Jahrbuch., Syst. VIII. 1895, p. 496: Cano, Boll. Soc. Nat. Napol. III, 1889, p. 189: J. R. Henderson, Trans. Linn. Soc. Zool. (2) V. 1893, p. 353: Ortman, Zool. Jahrbuch., Syst. VII. 1894, p. 469.

Front obliquely deflexed, the median lobe very decidedly bilobulate and separated from the lateral lobes on either side by a deep notch.

Carapace with not less than eleven large roundish dark-red blots (which seem never to completely fade even in very old Museum specimens) disposed as follows:—two on either side immediately behind the eye, the smaller and anterior one of these involving the orbital margin; three in a transverse curve across the middle of the carapace; four in another transverse line just in front of the posterior margin.

Eight specimens, from the Andamans, Nicobars, and Palk Straits.

## 2. *Carpilius convexus*, (Forsk.) Rüppell.

*Cancer convexus*, Forskal, Descr. Anim. p. 88.

*Cancer adspersus*, Herbst, Krabben, I. ii. 264, pl. xxi. fig. 1.

*Cancer marmarinus*, Herbst, Krabben, III. iv. 7, pl. lx. fig. 1.

*Carpilius convexus*, Rüppell, 24 Krabben roth. Meer. p. 13, pl. iii. fig. 2 and pl. vi. fig. 6: Milne Edwards, Hist. Nat. Crust. I. 382, pl. xvi. figs. 9, 10: DeHaan, Faun. Japon. Crust. p. 17 (name only): Dana, U. S. Expl. Exp. Crust. pt. I. p. 159, pl. vii. fig. 5: Stimpson, Proc. Acad. Nat. Sci. Philad. 1858, p. 32: Heller, SB. Ak. Wien XLIII. 1861, p. 319: Alph. Milne Edwards in Maillard's Pile Réunion Annexe F. p. 3, and Nouv. Archiv. du Mus. I. 1865, p. 215, and IX. 1873, p. 176: Hilgendorf in v. d. Decken's Reisen in Ost-Afrika III. i. p. 73: Hoffmann in Pollen and Van Dam, Faun. Madagasc., Crust. p. 3: Miers, P. Z. S. 1877, p. 133, and Ann. Mag. Nat. Hist. (5) II. 1878, p. 407: Richters in Möbius Meeresfauna Maurit. p. 145: E. Nauck, Zeitschr. Wiss. Zool. xxxiv. 1880, p. 56 (gastric teeth): Haswell, Cat. Austr. Crust. p. 41: F. Muller, Verh. Ges. Basel VIII. 1886, p. 473: de Man, Archiv. f. Naturges. liii. 1887, i. 232, and Zool. Jahrb. Syst. VIII. 1895, p. 496: Ortman Zool. Jahrbuch., Syst. etc., VII. 1894, p. 469, and in Semon's Zool. Forschungsr. (Jena. Denkschr. VIII.) Crust., p. 51: Zehntner, Rev. Suisse Zool. II. 1894, p. 143.

*Carpilius lividus*, Gibbes, Proc. Amer. Ass. III. 1850, p. 174, is according to A. Milne Edwards, vide Nouv. Archiv. du Mus. I. 1865, p. 217, the young of *Carpilius convexus*. Miers also, Ann. Mag. Nat. Hist. (v) II. 1878, p. 407, considers *C. lividus* to be a synonym of *Carpilius convexus*.

Front vertically deflexed, the prominent median lobe is not decidedly bilobulate—in fact, it is sometimes but obscurely emarginate at tip—and is separated on either side from the lateral lobes by only a shallow excavation.

Carapace irregularly marbled with dark red, which in old spirit specimens sometimes fades entirely.

Seven specimens from the Andamans and Nicobars.

## CARPILODES, Dana, A. Milne Edwards.

*Carpilodes*, Dana, Silliman's Amer. Journ. Sci. and Arts, (2) XII. 1851, p. 126, and Proc. Acad. Nat. Sci. Philad. VI. 1852, p. 77, and U. S. Expl. Exp. Crust. pt. I. p. 192.

*Carpilodes*, Alph. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 224 (et synon.)

*Carpilodes*, Miers, Challenger Brachyura, p. 133.

*Carpilozanthus*, Alph. Milne Edwards in Maillard's l'île Réunion, Annexe F, p. 3. (A. M. E.)

Carapace very broad, convex in both directions, with the regions generally well demarcated and—especially in the anterior half—subdivided into lobular areolæ; its antero-lateral borders usually subdivided into four broad, shallow, rounded lobes; its postero-lateral borders straight, or a little concave, and strongly convergent.

Front broad (about a third the greatest breadth of the carapace) obliquely deflexed, grooved and slightly notched in the middle line, but not distinctly bilobed.

Orbits small, with entire margins, but usually with the three suture lines near the outer angle more or less distinct: eye-stalks short and thick.

Antennules folding obliquely, almost transversely. Basal antennal joint running up between the front and the lower orbital plate much as in *Carpilius*; the flagellum rather longer than the major diameter of the orbit.

Anterior edge of merus of external maxillipeds almost transverse.

Chelipeds equal or subequal in both sexes: fingers pointed, but distinctly grooved or hollowed near the tips.

Abdomen of the male five-jointed, the 3rd–5th somites fused.

Small crabs, easily recognizable by their short broad convex carapace, with its antero-lateral margins in the form of four broad shallow rounded lobes, its postero-lateral margins strongly convergent, and the broad deflexed rather prominent and convex front.

*Key to the Indian species of Carpilodes.*

I. Surface of carapace quite smooth to the naked eye:—

i. Upper border of meropodites of legs crest-like ... *C. lophopus.*

ii. Upper border of meropodites of legs not crest-like:—

1. Posterior part of carapace not lobulated:—

a. Gastric region subdivided into three lobules only ... .. *C. tristis.*

b. Gastric region subdivided into five lobules:—

a. Outer surface of wrist and hand smooth ... .. *C. venosus.*

β. Outer surface of wrist nodular, of hand granular... .. *C. stimpsoni.*

2. The whole of the carapace divided into a network of lobules by fine lines ... .. *C. pediger.*

- II. Part or all of the surface of the carapace covered with vesiculous granules plainly visible to the naked eye:—
- i. Posterior part of the carapace not lobulated:—
    1. The whole of the carapace covered with granules ... .. *C. rugatus.*
    2. Only the antero-lateral part of the carapace granular ... .. *C. vaillantianus.*
  - ii. Posterior part of the carapace more or less divided into lobules by transverse grooves: the whole surface of the carapace densely granular:—
    1. A single transverse furrow behind the gastric region ... .. *C. margaritatus.*
    2. Two transverse furrows (exclusive of one that helps to form the raised posterior margin) behind the gastric region:—
      - a. Branchial lobules few, long, roll-like... *C. monticulosus.*
      - b. Branchial lobules many, small, nodule-like ... .. *C. cariosus.*

### 3. *Carpilodes tristis*, Dana.

*Carpilodes tristis*, Dana, U. S. Expl. Exp. Crust. pt. I., p. 193, pl. ix. figs. 7a-d: Heller, Novara Crust. p. 17: Alph. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 225, and IX. 1873, p. 178: Haswell, Cat. Austr. Crust. p. 56: F. Muller, Verh. Ges. Basel, VIII. 1886, p. 474: de Man, Notes Leyden Mus. XII. 1890, p. 50: J. R. Henderson, Tr. Linn. Soc., Zool., (2) V. 1893, p. 353: Ortmann, in Semon's Zool. Forschungr. (Jena. Denkschr. VIII) Crust. p. 51.

Surface of carapace and appendages quite smooth to the naked eye, but with a dull look due to uniform microscopic miliary granulation. Gastric region delimited from the front, from the somewhat tumid supra-orbital margins, and posteriorly, by shallow grooves, and sharply demarcated from the branchial regions by fine sharp-cut lines; and subdivided into three lobules by a fine sharp-cut  $\Lambda$  shaped median incision.

Antero-lateral borders divided into four lobes, from the intervals between which fine sharp lines run obliquely inwards to incompletely subdivide the hepatic and branchial regions into lobules. Outer part of hepatic regions on a plane slightly lower than that of the rest of the carapace.

Colours in spirit: uniform dull brownish-buff, except the fingers and a large part of the lower border of the hand, which are black.

79 specimens from the Andamans and Nicobars.

### 4. *Carpilodes stimpsoni*, A. Milne Edwards.

*Carpilodes stimpsoni*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 232, pl. xi. figs. 2-2c, and IX. 1873, p. 181: de Man, Archiv. fur Naturges. LIII. 1887, i. p. 234, and Journ. Linn. Soc., Zool., vol. XXII. 1887-88, p. 25.

Differs from *Carpilodes tristis* Dana in the following more conspicuous particulars:—

(1) the surface of the carapace is of a shiny smoothness, except for some irregular pitting on the lobules of the anterior portion:

(2) the gastric region is subdivided into five longitudinal lobules (as in all the following species) by incisions running almost parallel with the limbs of the  $\Lambda$  shaped median incision:

(3) the chelipeds have the upper and outer surface of the wrist nodular and of the hand granular, and the upper surface of the corresponding joints and merus of the legs nodular:

(4) the colour in spirit is light yellowish.

A single specimen from Mergui.

It appears to me very doubtful whether this species is really distinct from *C. venosus*.

##### 5. *Carpilodes venosus*, (Edw.)

*Carpilius venosus*, Milne Edwards, Hist. Nat. Crust. I. 383.

*Carpilodes venosus*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 227, pl. xii. figs. 2-2b, and IX. 1873, p. 179: Miers, Zool. H. M. S. "Alert," pp. 183 and 213: Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 353.

*Xantho obtusus*, De Haan, Faun. Japon. Crust., p. 47, pl. xiii. fig. 5: Krauss, Sudafr. Crust. p. 31.

Included in the Indian fauna on the authority of Dr. J. R. Henderson: there are no specimens in the Indian Museum referable to this species, unless (as, indeed, I believe) *C. stimpsoni* is synonymous.

From Milne Edwards' figures this species differs from *C. stimpsoni* in having the chelipeds and legs perfectly smooth.

##### 6. *Carpilodes pediger*, n. sp.

Allied to *C. venosus* and *stimpsoni*, from which it differs in having the whole of the carapace mapped out in lobules.

Most closely allied to *C. ruber* A. M. Edw., from which it conspicuously differs in the form of the male chelipeds.

Carapace extremely convex in both directions, its surface, like that of the appendages, being perfectly smooth to the naked eye though very finely granular under the lens: it is symmetrically and minutely subdivided by fine lines into very many little-convex and rather angular-outlined lobules. The antero-lateral borders are rather deeply four-lobed, the prominence of the outer angle of the orbit forming a small fifth lobule.

The chelipeds in the adult male are close upon twice the length of the carapace and have a very strong tooth on the inner upper border of

the wrist, and strongly-arched fingers which meet only at the tip, the movable finger bearing (in addition to the serrations of the hollow tip) a strong tooth near the base.

In the adult female the chelipeds are very little longer than the carapace and have only a small tooth on the wrist, and fingers which are not strongly arched but meet through the greater part of their extent.

Colours in spirit, light straw, fingers very light brownish: sometimes the wings of the carapace are light grey and then there is also a light grey stripe down the middle of the carapace, fore and aft.

Length of carapace 6·5 millim., breadth 10 millim.

Off Andaman Is. 10–41 fms., off Ceylon 26½ fms.

Seven specimens.

#### 7. *Carpilodes lophopus*, n. sp.

All parts are smooth to the naked eye, though under the lens the surface of the carapace and chelipeds is minutely pitted or eroded. The regions are demarcated and subdivided by very fine lines; and the lateral gastric areolæ (2 M of Dana) and the mid-branchial areolæ (4 and 5 L of Dana) are particularly, and rather angularly, convex.

The antero-lateral borders are four-lobed, the last two lobes being rather angular; the postero-lateral borders are markedly concave.

The front is broad and projects well beyond the orbits.

Chelipeds not very much longer than the carapace: two little tubercles, one above the other, at the inner angle of the wrist, and two at the distal end of the upper border of the hand.

The upper border of the meropodites of the legs is distinctly cristiform, that of the carpopodites is sinuous-cristiform, and both the upper and the lower edges of the propodites are cristiform—the lower more distinctly than the upper.

Colours in spirit, yellowish white.

Carapace about 5·5 millim. long, about 8·5 millim. broad.

Off south-east coast of Ceylon, 34 fms., a male and a female; a female from off Malabar coast, 29 fms.

#### 8. *Carpilodes rugatus*, (Latr.) A. Milne Edwards.

*Zoymus rugatus*, Milne Edwards, Hist. Nat. Crust. I. 385, (A. M. E.)

*Zoymus canaliculatus*, Lucas, Voy. Astrolabe, Crust. p. 21, pl. iii. fig. 2 (A. M. E.)

*Carpilozanthus rugatus*, A. Milne Edwards in Maillard's *île Réunion, Annexe F*, p. 3. (A. M. E.)

*Carpilodes rugatus*, A. Milne Edwards, *Nouv. Archiv. du Mus.* I. 1865, p. 230, pl. xii. figs. 3, 3b, and IX. 1873, p. 180: Richters in Möbius Meeresf. Maurit. p. 146: Miers, *Zool. H. M. S.* "Alert," pp. 517 and 529.



Surface of carapace uniformly covered with granules which are visible to the naked eye and on the antero-lateral parts of the carapace are vesiculous: the upper and outer surfaces of the wrist and hand, and of the corresponding joints of the legs, are closely granular to the naked eye, the granules of the hand being arranged in longitudinal series.

As in all the Indian species of *Carpilodes* except *C. tristis*, the frontal and supra-orbital borders are cut off from the rest of the carapace by a sinuous groove which also includes the two front lobes of the four-lobed antero-lateral border, and the gastric region is longitudinally 5-lobular.

Transverse grooves running from the last two intervals between the lobes of the antero-lateral border cut off, respectively, (1) the hepatic from the branchial regions, and (2) the first branchial lobule from the rest of the branchial region. All the lobules are strongly convex.

The cardiac region is not defined, and there is no lobulation of the posterior moiety of the carapace.

Colours in spirit—pink, fingers purplish-brown with white tips.

3 specimens from the Cocos Islands (Andamans).

#### 9. *Carpilodes vaillantianus*, A. Milne Edwards.

*Carpiloxanthus vaillantianus*, A. Milne Edwards, in Maillard's *Île Réunion Annexe F*, p. 3. (A. M. E.)

*Carpilodes vaillantianus*, A. Milne Edwards, *Nouv. Archiv. du Mus.* I. 1865, p. 231, pl. xi. figs. 3-3b. Haswell, *Cat. Austral. Crust.* p. 57: Miers, *Zool. H. M. S. "Alert,"* p. 529: de Man, *Archiv. f. Naturges.* LIII. 1887, i. p. 235: Ortmann in *Semon's Zool. Forschungs.* (Jenaische Denksch. VIII.), *Crust.* p. 51.

This species, if it is really distinct from *C. rugatus*, differs from the latter in the following particulars:—

(1) the granulation is confined to the antero-lateral parts of the carapace:

(2) the lobules of the carapace are less convex:

(3) the furrow that cuts off the anterior branchial lobule does not meet the furrow that bounds the gastric region.

Among 17 specimens in the Indian Museum there is a good deal of variation of these characters; so much so, that some of the specimens might almost be referred to *C. rugatus*, especially to the "Astrolabe" figure.

Five specimens from the Andamans, three from Muscat, two from Mergui; (the others from Mauritius, Samoa, and Viti).

#### 10. *Carpilodes margaritatus*, A. Milne Edwards.

*Carpilodes margaritatus*, A. Milne Edwards, *Nouv. Archiv. du Mus.* IX. 1873,

p. 182, pl. v. fig. 2: Henderson, Trans. Linn. Soc. Zool. (2) V. 1893, p. 353: Whitelegge, Mem. Austral. Mus. III. 1897, p. 131.

Carapace and legs covered with pearly granules plainly visible to the naked eye. The carapace is much lobulate, the anterior branchial lobe being itself trilobulate, and the region behind the gastric region being crossed transversely by a furrow. The antero-lateral borders are indistinctly four-lobed. *The hands are not longitudinally furrowed.*

Colours; red, fingers black.

No specimens in the Indian Museum collection. Included here on the authority of Dr. J. R. Henderson.

### 11. *Carpilodes cariosus*, n. sp.

Allied to *C. margaritatus*.

Carapace strongly convex, its whole surface intricately cut up, by deep grooves, into many small strongly-convex lobules, the surface of which is pitted and granular, so as to give the carapace as a whole a somewhat worm-eaten appearance.

The legs also have the extensor surfaces of the long joints granular and nodular: the outer surface of the wrist is nodular: the outer surface of the hand is granular and furrowed.

The antero-lateral borders are very distinctly four-lobed.

The space between the gastric region and the posterior border of the carapace is broken by two (or three, counting the groove inside the raised posterior border) deep transverse grooves, the space between the grooves being Cupid's-bow-shaped. A transverse groove also cuts off a narrow piece from the posterior extreme of the mesogastric lobule.

Colours in spirit; whitish with pink spots on carapace, legs pink, fingers sometimes black with white tips, sometimes pinkish white.

Length of carapace about 5 millim., breadth about 7 millim.

Off Ceylon  $26\frac{1}{2}$  to 34 fms., 13 specimens including several ovigerous females: off Andamans 10 to 15 fms., 2 specimens.

### 12. *Carpilodes monticulosus*, A. Milne Edwards.

*Carpilodes monticulosus*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 181, pl. v. fig. 1: de Man, Archiv. f. Naturges. LIII. 1887, i. p. 233: Ortman in Semon's Forschungsreisen (Jena. Denkschr. VIII.) Crust. p. 51.

Carapace very broad (not far short of twice as broad as long), its surface everywhere closely covered with elegant vesiculous granules. The whole of the carapace is divided, by deep broadish grooves, into elongate lobules of an elegant smooth roll-like form (quite unlike any other Indian species). A narrow beaded lobule forms the posterior limit of the mesogastric lobe (much as in *C. cariosus*), and two

furrows cross transversely the region between the latter and the posterior border of the carapace. On the branchial regions, on either side of the mesogastric lobule, is a small dimpled lobule. The wrist and hand are closely covered with granules like those on the carapace, the wrist being dimpled and the hand longitudinally furrowed.

The extensor surfaces of the legs are also closely, but much more finely, granular, the carpus in all being dimpled.

Antero-lateral borders four-lobed, the lobes narrow, rather shallow, rounded, and the last three of nearly equal size.

Colours in spirit; dark purplish-red, legs lighter, fingers white with brownish base.

Two specimens, from Gt. Coco I. (Andamans) and East I., Andamans are in the Indian Museum.

Carapace not quite 6 millim. long, 10 millim. broad.

#### LIOMERA, Dana.

*Liomera*, Dana Silliman's Amer. Journ. Sci. and Arts (2) XII. 1851, p. 124; Proc. Acad. Nat. Sci. Philad. 1852, p. 73; and U. S. Expl. Exp. Crust. pt. I. p. 160.

*Liomera*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 218, and Exp. Sci. Mex. Crust. p. 239.

Carapace extremely broad, strongly convex in both directions, transversely barrel-like, either smooth or with the regions very faintly indicated; its antero-lateral borders thick, either entire or divided into four broad shallow rounded lobes, of which the first two are almost coalescent; its postero-lateral borders very strongly convergent, straight or a little concave.

Front narrow (from a third to less than a fourth the breadth of the carapace), obliquely deflexed, grooved and slightly notched in the middle line, but not distinctly bilobed.

Orbits small, with the three suture lines near the outer angle usually distinct; eye-stalks short and thick.

The antennules fold nearly transversely. Basal antennal joint broad and short, merely touching the front; the flagellum, which is short, lodged in the orbital hiatus.

Anterior edge of merus of external maxillipeds a little oblique.

Chelipeds equal or subequal in both sexes; fingers somewhat hollowed at tip. Legs sub-cylindrical.

Abdomen of the male five-jointed, the 3rd—5th somites being fused.

Small or medium-sized crabs, easily recognized by their short, very broad, strongly convex, barrel-like carapace.

13. *Liomera cinctimana*, (White), Dana.

*Carpilius cinctimanus*, White, in Jukes Voyage H. M. S. "Fly," Vol. II. p. 336, pl. ii. fig. 3, and Samarang Crust. p. 37, pl. vii. fig. 4.

*Liomera cinctimana*, Dana, Silliman's Journ. (2) XII. 1851, p. 124, and U. S. Expl. Exp. Crust. pt. I. p. 161: A. Milne Edwards Nouv. Archiv. du Mus. I. 1865, p. 219, and IX. 1873, p. 176, pl. v. fig. 4, and Exp. Sci. Mex. Crust. p. 240: Stimpson, Ann. Lyc. New York, X. 1874, p. 103.

*Carpilodes cinctimanus*, Miers, Ann. Mag. Nat. Hist. (5) V. 1880, p. 234: Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 354.

*Liomera lata*, Dana, Proc. Ac. Nat. Sci., Philad. 1852, p. 73, and U. S. Expl. Exp. Crust. pt. I. p. 161, pl. vii, figs 6a-d: Stimpson, Proc. Acad. Nat. Sci. Phil. 1858, p. 32, and Ann. Lyc. New York, X. 1874, p. 104: Heller, Novara Crust. p. 9: A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 220, and Exp. Sci. Mex., Crust. p. 240: F. Muller, Verh. Ges. Basel. VIII. p. 474.

Carapace extremely broad—its length only about  $\frac{2}{5}$  of its breadth—its surface, like that of the appendages, everywhere smooth and polished, showing only the faintest indications of a gastro-cardiac region and of oblique lobulation of the branchial regions: the antero-lateral border is divided into three coarse lobes, the anterior of which is again obscurely divided into two.

Front obliquely deflexed, with a rather prominent convex edge cleft in the middle line. Orbital margin with three radiating suture-lines near the outer angle. Chelipeds equal.

Colours in spirit; orange-red, fingers black, hand with a broad black cross-band merging with the black of the immobile finger.

3 specimens from the Andamans and Muscat (besides specimens from Mauritius and South Sea Is.).

14. ? *Liomera sodalis*, n. sp.

Carapace broad (length about  $\frac{2}{3}$  breadth) very strongly convex, perfectly smooth, without any indication of regions, its margins smooth, entire. Front nearly vertically deflexed, its edge cleft in the middle line. Eyes large, supra-orbital margin without any suture-lines. Chelipeds a little unequal; the upper and outer surfaces of the carpus and hand of the smaller cheliped covered with prickly granules, but in the larger cheliped the granulation has a very much worn appearance: fingers hardly hollowed at tip.

Legs (those that are present in the unique specimen) somewhat hairy; none of the joints are carinate though some have prickly granules on the upper surface.

Colours in spirit—of the same blotchy orange and reddish colour as that of a species of *Solenocaulon*, in the hollow stem of which the crab was found.

Length of carapace 6 millim., breadth 9 millim.

Off south-east corner of Ceylon, 32 fms.

This species resembles a small *Atergatis*, but has sub-cylindrical legs and has no margin to the carapace.

#### LACHNOPODUS, Stimpson.

*Lachnopus*, Stimpson, Proc. Ac. Nat. Sci. Phila. 1858, p. 32 : A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 233 : Ortman, Zool. Jahrb. Syst. VII. 1893-94, p. 452.

“Carapax laevis, regione posticâ transversim convexâ. Orbita margine externâ trifissâ vel trilobatâ, lobis parvis, obtusis. Antennæ ut in *Carpilio* (ut in *Liomerâ* ?). Gnathopoda intima laciniâ ad apicem non furcatâ. Hectognathopoda ischio longitudinaliter sulcato; mero superficie versus angulum internum excavatâ, margine anteriore concavâ. Chelopoda manu facie externâ sulcatâ. Pedes ambulatorii valde setosi, mero compresso, superne spinoso.

“*Liomeræ* affinis, sed carapace angustiore, pedibus setosis spinosisque.”

This genus is not represented in the Indian Museum.

#### 15. *Lachnopus rodgersii*, Stimpson.

*Lachnopus rodgersii*, Stimpson, Proc. Ac. Nat. Sci. Phila. 1858, p. 32.

*Liomerâ rodgersii*, Miers, Ann. Mag. Nat. Hist. (5) V. 1880, p. 231, pl. xiii. fig. 3, (orbit and antennæ only): de Man, Archiv. für Naturges. LIII. 1887, i. p. 237 : J. R. Henderson, Trans. Linn. Soc. Zool. (2) V. 1893, p. 354.

“Carapace transverse, about once and a half as broad as long, smooth, glabrous, and shining, with the interregional sutures almost obsolete; the two posterior teeth of the antero-lateral margins are the only ones developed, and are very obscurely marked and obtuse. The front is somewhat produced, and is divided by a median and two lateral incisions into four lobes, of which the two median are broad and truncated, and the lateral (or inner orbital lobes) are small and denticiform. On the upper orbital margin are three small obtuse teeth (including that of the outer orbital angle); the tooth at the inner and lower orbital angle is rather prominent. The merus-joint of the outer maxillipeds is rather small and transverse; and this joint has a shallow pit on its outer surface. The anterior legs (in the male) are robust, smooth; arm or merus-joint with a series of spinules on its upper margin; carpus smooth, with an antero-internal tooth; penulti-

mate joint or palm slightly rugose externally, and with two longitudinal and parallel grooves on its outer surface; fingers short, robust, toothed on their inner margins and with the apices not excavated. The ambulatory legs are somewhat compressed and clothed with long fulvous hairs; their merus-joints are spinulose on their upper margins. The postabdomen of the male is five-jointed, the third to fifth joints being coalescent. Length  $8\frac{1}{2}$  lines, breadth nearly 1 inch 1 line.

This species has been hitherto known only from the very short generic definition of Dr. Stimpson, which, however, embraces all the characteristic peculiarities of the species, and which agrees exactly with the example before me, except in one point. Stimpson says (l. c.), "Antennae ut in *Carpilio*." In the specimen now before me the antennae are of the same structure as in *Liomera*, the basal joint being very short and united at its summit to an inferior prolongation of the front, and not, as in *Carpilius*, joined to the front along its inner margin. I have little doubt that Stimpson erroneously wrote *Carpilius* for *Liomera*, as he does not say that *Lachnopus* is distinguished from *Liomera* by any peculiarity in the structure of the antennæ.

I do not think that *Lachnopus* is generically distinct, as Milne Edwards has described a *Liomera* (*L. longimana*) with hairy ambulatory legs." (Miers.)

#### GENUS LIOXANTHO.

Carapace broad, moderately or strongly convex in its anterior two-thirds, flat posteriorly; the gastric region is fairly or faintly delimited, and one or two short furrows may pass on to it obliquely from the intervals between the lobes of the antero-lateral margin, but beyond this there is no distinct division of the carapace into regions or sub-regions.

The antero-lateral borders are much like that of *Liomera*, being divided into 4 broad blunt lobes, of which the first two are so much coalescent as to really form but one.

Front somewhat deflexed, bilobed, or sinuous and notched in the middle line. Fronto-orbital border less than half the greatest width of the carapace.

Orbital margin and antennæ as in *Xantho*.

Anterior edge of merus of external maxillipeds a little more oblique than in *Xantho*.

Chelipeds either subequal or unequal in both sexes, fingers pointed. Legs subcylindrical.

Abdomen of male five-jointed, the 3rd-5th somites coalescent.

*Key to the species of the genus Lioxantho.*

- I. Chelipeds unequal, outer angles of front separated from the supra-orbital margin by a notch; regional markings of carapace almost obsolete ... .. *L. tumidus.*
- II. Chelipeds equal, outer angles of front fused with supra-orbital margin:—
- i. Carapace chelipeds and legs smooth as wax ... .. *L. punctatus.*
- ii. Carapace chelipeds and legs uniformly closely and finely granular ... .. *L. asperatus.*

16. *Lioxantho punctatus*, (Edw.)

*Xantho punctatus*, Milne Edwards, Hist. Nat. Crust. I. 396: A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 199, pl. vii. fig. 6: Miers, Challenger Brachyura, p. 125: de Man, Zool. Jahrb. Syst. IV. 1889, p. 420, and Notes Leyden Mus. XII. 1890, p. 52, pl. iii. fig. 1.

*Liomera punctata*, Miers, Zool. H. M. S. Alert, pp. 517, 528: de Man, Archiv. fur Naturges. LIII. 1887, i. p. 238: J. R. Henderson, Trans. Linn. Soc. Zool., (2) V. 1893, p. 354: Ortmann, Zool. Jahrb., Syst. VII. 1893-94, p. 451.

Carapace moderately convex in the anterior two-thirds, flat posteriorly, its surface smooth. The gastric region is fairly well defined antero-laterally, and the fronto-orbital region marked off, by distinct grooves; and two short grooves (of which the anterior is the longer) pass in obliquely from the notches between the 2nd and 3rd, and 3rd and 4th lobes of the antero-lateral margin; but this is all the areolation that exists.

Antero-lateral border moulded into four broad shallow lobes, of which the first two are almost coalescent.

Front bilobed, the outer angle of each lobe fused with the supra-orbital border, as in *Xantho impressus* and as in no other Indian species of *Xantho*: the width of the front is about a fourth the greatest breadth of the carapace.

Chelipeds equal in both sexes, perfectly smooth, although a very indistinct groove sometimes runs about half way along the outer surface of the hand near the upper border.

Legs thickish, smooth, the dactylus with some fur and a few short hairs.

Colours in spirit; pinkish yellow or buff, with small red spots on carapace, and ill-defined pinkish-brown patches on chelipeds and legs; fingers black, with light brown tips.

In the Indian Museum are 3 specimens from Ceylon, (as well as 8 from Mauritius and 2 from Samoa).

17. *Lioxantho tumidus*, n. sp.

Carapace in its anterior two-thirds strongly convex from before

backwards and a little convex from side to side, flat in its posterior third; perfectly smooth and polished. The limits of the gastric region, and its division into three sub-regions, are faintly apparent as mere markings, not grooves; and the fronto-orbital region is marked off by a faint groove.

The antero-lateral border is divided into four broad shallow lobes, of which the first two are almost confluent; from the notch between the second and third a short groove runs obliquely inwards on to the carapace, and a still shorter one from the notch between the third and fourth.

Front much less than a fourth the greatest width of the carapace, bilobed, the outer angle of each lobe separated from the supra-orbital margin by a notch and groove.

Chelipeds unequal, smooth and polished.

Legs rather thick, smooth; a few scattered hairs along the upper border of the last three and along the lower border of the last two joints, the dactylus also furred. The upper border of the meropodites of all the legs, as well as of the arm, is microscopically serrulate or crenulate.

Colours in spirit pinkish yellow, fingers black with light brown tips.

In the Indian Museum are 3 specimens from the Andamans, (and one from Samoa).

This species exactly resembles a quite smooth and strongly-inflated *Xantho bidentatus*, and but that I have 4 specimens, representing both sexes and different ages, I should have regarded it as an abnormality of that species.

It also has a remarkable resemblance to the *Xantho (Lachnopus) tahitensis* figured and described by de Man in Zool. Jahrb. Syst. IV. 1889, p. 418, pl. ix. fig. 4; but it has not the row of strong spines along the upper border of the meropodites of the chelipeds and legs, that are characteristic of that species.

#### 18. *Lioxantho asperatus*, n. sp.

Carapace very slightly convex fore and aft in its anterior two-thirds, quite flat posteriorly and from side to side, very closely sharply and uniformly granular everywhere except the posterior median portion, where the granulation is visible only under a lens. The gastric region is faintly delimited, a short bifurcating groove runs in from the frontal notch, and two very faint grooves run in obliquely from the two notches of the antero-lateral margins, but this is all the attempt at areolation that exists.



Antero-lateral border granular and rather sharp, very obscurely divided into three most inconspicuous lobes, the first of which hardly shows a trace of subdivision.

Front not quite a fourth the greatest breadth of the carapace, obliquely deflexed, emarginate and faintly grooved in the middle line, its outer angles not separated from the supra-orbital margin.

Chelipeds equal, the upper corner of the outer surface of the arm, the upper and outer surfaces of the wrists and hands, closely covered with little pearly granules like those on the antero-lateral parts of the carapace.

Legs stout: the upper edge of the merus and the dorsal surface of the next two joints granular like the chelipeds, the dactylus hairy.

Colours in spirit orange-yellow.

In the Indian Museum are a male and female probably from Karáchi.

#### LIAGORE, De Haan.

*Liagore*, De Haan, Faun. Japon. Crust. p. 19.

*Liagora*, Dana, Amer. Jour. Sci. and Arts (2) XII. 1851, p. 124; and U. S. Expl. Exp. Crust. pt. I. p. 148.

Carapace somewhat approaching the quadrilateral, strongly convex fore-and-aft, little convex from side to side, smooth, without any indication of regions.

Antero-lateral border moderately arched, entire; postero-lateral border very moderately convergent, straight, about as long as the chord of the antero-lateral; posterior border long,—about half the greatest width of the carapace in length, or more.

Fronto-orbital border about half, front about quarter, the greatest width of the carapace in extent. Front a little deflexed, broadly bilobed. Orbital margin thin entire, the outer angle of orbit a little thickened. Eyes on very short thick stalks.

The antennules fold nearly transversely. Basal antennal joint very short and broad, but passing up between the side of the front and the inner angle of the orbit; the flagellum, which is about as long as the major diameter of the orbit, lodged in the orbital hiatus.

Anterior edge of merus of external maxillipeds somewhat oblique.

Chelipeds massive, equal in both sexes, the fingers pointed.

Legs subcylindrical, rather long, smooth.

Abdomen of male five-jointed, the 3rd–5th somites fused.

#### 19. *Liagore rubromaculata*, De Haan.

*Cancer (Liagore) rubromaculatus*, De Haan, Faun. Japon. Crust. p. 49, pl. v. fig. 1.

*Liagore rubromaculata* Miers, Ann. Mag. Nat. Hist. (5) II. 1878, p. 407 (note); and Challenger Brachyura, p. 111, (footnote).

Carapace transversely somewhat oval, approximating the quadrilateral type, with long posterior and only moderately convergent postero-lateral borders; its surface devoid of sculpture and perfectly smooth to the naked eye, microscopically pitted and granular: pterygostomial region somewhat hairy.

Antero-lateral border moderately sharp, entire. Front broadly and rather faintly bilobed, the outer angles of each lobe pronounced, prominent, and separated from the supra-orbital margin by a short shallow groove. A little pimple-like thickening at the outer angle of the orbit.

Chelipeds equal, smooth and polished: both borders of the arm hairy, the upper border with a few blunt denticles; both the inner and the outer angles of the wrist strongly pronounced; fingers long, pointed, with the opposed edges strongly but bluntly serrate.

Legs long, subcylindrical, smooth and polished, the dactyli most elegantly plumed.

Colours in spirit yellowish with numerous large livid red spots.

In the Indian Museum is a single specimen dredged off the Irrawaddy Delta in 20 fms., (besides 8 from Hongkong).

#### Alliance II. *Zozymoida.*

Atergatis.	Lophactæa.
	Zozymus.
	Lophozozymus.

#### ATERGATIS, De Haan, A. Milne Edw.

*Atergatis*, De Haan, Faun. Japon. Crust. p. 17.

*Atergatis*, Dana, Silliman's Journ. Sci. and Arts (2) XII. 1851, p. 124, and U. S. Expl. Exp. Crust. pl. I. p. 57.

*Atergatis*, A. MILNE EDWARDS, ANN. SCI. NAT. ZOOL. (4) XVIII. 1862, p. 49, and NOUV. ARCHIV. DU MUS. I. 1865, p. 231.

*Atergatis*, Miers, Challenger Brachyura, p. 111.

*Platypodia*, Bell, Trans. Zool. Soc. I. 1835, p. 336.

Carapace externally broad, convex in both directions, regional boundaries absent or quite inconspicuous, surface either quite smooth or somewhat pitted; its antero-lateral borders strongly arched and *with an independent keel-like edge*; the postero-lateral strongly convergent, straight. The under surface of the wings of the carapace is a good deal hollowed to receive the wrists and hands in flexion.

Front narrow (from a fourth to less than a fifth the greatest breadth of the carapace) more or less deflexed, its edge shaped like cupid's bow (*i.e.*, not bilobed).

Orbital margin with the three suture-lines near the outer angle fine and faint but distinct: eyestalks short and thick, eyes small.

Antennules folding transversely, inter-antennular septum broad.

Basal joint of antennæ short, touching the front only at their antero-external angle; flagellum lodged in the orbital hiatus, short (less than the major diameter of the orbit).

Merus of external maxillipeds with the anterior border almost transverse.

Chelipeds subequal in both sexes; fingers pointed, not distinctly hollowed at tip.

Legs with the upper border of the merus carpus and propus, and the lower border of the merus and propus, sharply carinate or cristate.

Abdomen of the male five-jointed, the 3-5th somites being fused.

Medium-size and large crabs.

#### *Key to the Indian species of Atergatis.*

- I. Edge of antero-lateral borders of carapace sharp and crest-like, forming a tooth or ridge at the lateral epibranchial angle:—
- i. Carapace with an even surface, without indications of regions:—
    1. Surface of external maxillipeds almost devoid of hair; no comb-like tufts of hair on the legs ... .. *A. integerrimus.*
    2. Surface of external maxillipeds like a doormat; comb-like tufts of thick hair on the under surface of some of the joints of the legs ... .. *A. dilatatus.*
  - ii. Carapace with the surface somewhat lumpy; variegated with spots and confluent blotches ... *A. floridus.*
- II. Edge of antero-lateral borders of carapace thick and blunt; no ridge or tooth at the lateral epibranchial angle ... .. *A. roseus.*

#### 20. *Atergatis integerrimus* (Lam.)

*Cancer integerrimus*, Lamarck, Hist. Nat. Anim. sans Vert. V. Crust. p. 272: Milne Edwards, Hist. Nat. Crust. I. 374 and in Cuvier's Règne An. Crust. pl. xi bis., fig. 1.

*Atergatis integerrimus*, De Haan, Faun. Japon. Crust. p. 45, pl. xiv. fig. 1: Dana U. S. Expl. Exp. Crust. pt. I. p. 158: Stimpson, Proc. Ac. Nat. Sci. Phila. 1858, p. 32: A. Milne Edwards, Nouv. Arch. du Mus. I. 1865, p. 235: Miers, Ann. Mag. Nat. Hist. (5) V. 1880, p. 231: Richters, in Möbius Meeresf. Maurit. p. 145: F. Muller, Verh. Ges. Basel, VIII. 1886, p. 474: de Man, Archiv. fur Naturges. LIII. 1887, i. p. 244, and Journ. Linn. Soc., Zool., XXII. 1888, p. 24, and Zool. Jahrbuch. Syst. VIII. 1895, p. 496: A. O. Walker, Journ. Linn. Soc., Zool., XX. 1890 p. 109:

J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 352: Ortmann, Zool. Jahrbuch Syst. VII. 1894, p. 462.

*Atergatis subdivisus*, White, Ann. Mag. Nat. Hist. (2) 1848, p. 284, and Samarang Crust. p. 38, pl. viii. fig. 3.

?*Atergatis subdentatus*, De Haan, Faun. Jap. Crust. p. 46, pl. iii. fig. 1: A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 236.

Carapace, length from about  $\frac{4}{7}$  to about  $\frac{3}{5}$  the breadth; its surface in the anterior third or half irregularly and rather distantly pitted, especially near the front and antero-lateral borders: except for two faint creases that partly show the cardiac region, there are no other traces of regional divisions.

The crest-like edge of the antero-lateral border turns in at the lateral epibranchial angle to form a stout ridge there: this edge sometimes shows traces of two or three fissures.

The front, which is little prominent, meets the antero-lateral borders at a wide but very distinct angle.

Orbits very small, their width being much less than a third the width of the front.

Surface of the external maxillipeds either quite smooth or with short and scanty hair. Sternum smooth to the naked eye, or with a little scattered pitting.

Chelipeds equal; the upper edge of the merus sharply, the upper edge of the hand and finger strongly but more bluntly, crested; the upper outer surface of the hand with some scale-like roughening.

The outer surface of the legs is hardly pitted; the claw, in all the legs, is hairy, and there is a little tuft of hair near the far end of the lower edge of the propodite, but all the other joints are generally free of hair.

Colours in spirits, pinkish ochre, fingers blackish brown, with whitish tip and teeth.

30 specimens from Mergui, the Andamans, Ceylon and Singapore.

## 21. *Atergatis dilatatus*, De Haan, A. Milne Edwards.

*Atergatis dilatatus*, De Haan, Faun. Jap. Crust. p. 46, pl. xiv. fig. 2: A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 238, and NOUV. ARCHIV. DU MUS. IX. 1873, p. 183, pl. v. fig. 6: E. Nauck, Zeits. Wiss. Zool. XXXIV. 1880, p. 57, pl. i. figs. 19-21 (*gastric teeth*): F. Müller, Verh. Ges. Basel, VIII. 1886, p. 474: Henderson, Trans. Linn. Soc. Zool. (2) V. 1893, p. 353.

Closely resembles *A. integerrimus*, but easily recognized by the following constant differences:—

- (1) the carapace is even broader, and has a sharper edge:
- (2) the surface of the carapace is much more closely and extensively

pitted, no part being free from pitting except a small area in the mid-gastric region: the outer surface of the chelipeds and legs also is quite rough, from pitting:

(3) the creases that serve to show the cardiac region are much larger and deeper:

(4) the crest that bounds the endostome in front is higher:

(5) the external maxillipeds are closely covered, like a door-mat, with long thick bristles; and remarkable comb-like tufts of long stiff bristles are found along the front border of the ischium of the chelipeds and along the lower border of the ischium and merus of all the legs:

(6) the surface of the sternum is closely covered with confluent granules visible to the naked eye.

All these differences are to be noted in a large male with a carapace 119 millim. broad from Ceylon, in a medium-sized male (70 millim. broad) from the Andamans, and in two small females (59 and 44 millim. respectively) from widely different parts of the Andaman group—these four specimens being in the Indian Museum collection.

## 22. *Atergatis roseus* (Rüppell).

*Carpilius roseus* and *marginatus* Rüppell, 24 Krabben roth. Meer. p. 13, pl. iii. fig. 3 and pl. vi. fig. 7; p. 15, pl. iii. fig. 4.

*Cancer roseus* and *marginatus*, Milne Edwards Hist. Nat. Crust. I. 374, 375.

*Atergatis roseus* and *marginatus*, De Haan, Faun. Japon. Crust. p. 17 (names only):

*Atergatis roseus*, Heller SB. AK. Wien, XLIII. 1861, p. 309: A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 239: Kossmann, Reise roth. Meer. Crust. p. 19: Richters in Möbius Meeresf. Maurit. p. 145: Haswell, Cat. Austr. Crust. p. 42: Cano, Boll. Soc. Nat. Nap. III. 1889, p. 189: Ortman, Zool. Jahrb., Syst., VII. 1894, p. 461.

*Atergatis marginatus*, Krauss, Sudafr. Crust. p. 28: Dana U. S. Expl. Exp. Crust. pt. I. p. 158: A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 240.

*Atergatis laevigatus*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 241, pl. xv. figs. 4-4a: Henderson, Trans. Linn. Soc. Zool. (2) V. 1893, p. 352.

*Atergatis scrobiculatus*, Heller, Abhand. zool.-bot. Ges. Wien, XI. 1861, p. 5, and SB. AK. Wien, XLIII. 1861, p. 310: A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 242.

Carapace of much the same proportions as *A. integerrimus*, but with a perfectly smooth dull surface; no indication whatever of regions; the crest of the antero-lateral borders blunt and ending smoothly, without any ridge or tooth, at the lateral epibranchial angle.

Front, orbits, external maxillipeds and legs as in *A. integerrimus*. Fingers fluted, but upper edge of hand rounded, not crested.

Colours in spirit, brownish yellow, fingers blackish brown with whitish teeth and tips.

22 specimens from Karáchi, and Madras coast.

23. *Atergatis floridus*, (Rumph).

*Cancer floridus*, Rumph, Amboinsch. Rariteitk. p. 16, pl. viii. fig. 5: Linnæus, Syst. Nat. (xii) p. 1041.

*Cancer ocyroe*, Herbst, Krabben, III. ii. 20, pl. liv. fig. 2: Milne Edw. Hist. Nat. Crust. I. 375.

*Atergatis floridus*, De Haan, Faun. Jap. Crust. p. 46: Krauss, Sudafr. Crust. p. 27: Dana, U. S. Expl. Exp. Crust. pt. I. p. 159, pl. vii. fig. 4: Stimpson, Proc. Ac. Nat. Sci. Phila. 1858, p. 32: Heller, Novara Crust. p. 8: A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 243; and IX. 1873, p. 186: Targioni Tozzetti, Magenta Crust. p. 24: Miers, P. Z. S. 1877, p. 133, and Ann. Mag. Nat. Hist. (5) V. 1880, p. 231, and Zool. H. M. S. Alert, pp. 182, 207, and Challenger Brachyura, p. 112: Haswell, Cat. Austral. Crust. p. 41: F. Muller, Verh. Ges. Basel VIII. 1886, p. 474: de Man, Arch. fur Naturges. LIII. 1887, i. 245, and Journ. Linn. Soc. Zool., XXII. 1888, p. 24, and Weber's Zool. Ergeb. Niederl. Ost.-Ind. II. 1892, p. 277: A. O. Walker, Journ. Linn. Soc., Zool., XX. 1890, p. 109: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 352: Ortmann, Zool. Jahrb. Syst. VII. 1894, p. 460, and in Semon's Forschungsgr. (Jena. Denkschr. VIII) Crust. p. 51.

Carapace, length about  $\frac{7}{10}$  breadth; its surface of perfectly smooth texture, but rendered lumpy by broad shallow depressions that faintly define and subdivide the regions; the crest of the antero-lateral border is sharp and ends at a very distinct tubercle at the lateral epibranchial angle.

The front forms with the antero-lateral borders a semicircle. The orbits are rather large, their width being more than one-third that of the front.

External maxillipeds free from hair on the surface: the sternum and the surface of all parts of the appendages except the hands (which have some rough reticulations on the outer surface) are smooth.

Chelipeds equal, the upper edge of the merus and hand strongly and sharply carinate; the fingers fluted as usual. Legs with crested edges to the long joints, as in *A. integerrimus*.

Colours in spirit, yellow; carapace covered with symmetrically disposed brown spots and confluent blotches, chelipeds and legs with a few faint brown spots, fingers blackish with whitish teeth and tips.

86 specimens from the Andamans, Mergui, Ceylon, Laccadives and Karáchi.

24. *Atergatis* sp.

There is, in the Indian Museum, a little specimen of an *Atergatis*, which may perhaps be the *A. asperimanus* insufficiently characterized by White in the P. Z. S. 1847, p. 224 and in the Annals and Magazine of Natural History, 1848, Vol. II. p. 285, as follows:—

“Carapace with its latero-anterior sides with a cutting edge, part

“of carapace behind this punctate; the rest of the surface almost quite smooth with three or four impressed lines in front.

“Hands rugose, especially above; fingers, both movable and fixed, deeply channelled.

“Pale yellowish red; feet darker; fingers pale horn-coloured.

“Philippines.”

Our little specimen, from off Ceylon, 34 fms., agrees with this description; but the “impressed lines,” which define the gastro-cardiac region, are so faint as to be only just visible.

It has the crested legs of *Atergatis*.

#### LOPHACTÆA, A. Milne Edwards.

*Lophactæa*, A. Milne Edwards, Ann. Sci. Nat. Zool. (4) XVIII. 1862, p. 43; and Nouv. Archiv. du Mus. I. 1865, p. 245, and IX. 1873, p. 187.

*Lophactæa*, Miers, Challenger Brachyura, p. 113.

“The Lophactæas are distinguished from *Atergatis* by their narrower and always deeply lobulated carapace.”

Carapace moderately broad, convex in both directions, with the regions generally well delimited and subdivided into lobes, and the surface generally (not always) granular; the antero-lateral borders have an independent crest-like edge, generally thin and sharp and distinctly fissured; the postero-lateral borders are rather concave.

Front a little deflexed, about a fourth the greatest breadth of the carapace in extent, grooved and emarginate in the middle line, but not distinctly bilobed. Orbits large, the three suture lines near the outer angle distinct. Eyes on short thick stalks.

Antennules folding nearly transversely, inter-antennular septum broad. Basal joint of antennæ short, touching the front only; the flagellum lodged in the orbital hiatus. Merus of the external maxillipeds with the front edge a little oblique.

Chelipeds equal in both sexes; fingers not hollowed at tip. Long joints of legs with sharp crest-like upper borders much as in *Atergatis*.

Abdomen of the male five-jointed, the 3rd-5th somites being fused.

Small crabs.

*Lophactæa*, except that the fingers are pointed instead of broad and hollowed-out at tip, appears to me to be as closely as possible related to *Zozymus*. In *Lophactæa*, besides the difference in the fingers, the carapace is more convex and less cut up into lobules, and its surface is generally granular.

*Key to the Indian species of Lophactæa.*

- I. Regions and sub-regions of the carapace very distinct ; postero-lateral borders slightly concave, but not definitely marked off from the rest of the carapace :—
- i. Surface of carapace more or less covered with pearly granules :—
    1. Hand sharply crested along upper border :—
      - a. Pearly granules over the whole of the carapace, and over the outer surface of the carpus and propus of the walking legs ..... *L. cristata.*
      - b. Pearly granules absent from part of the post-cardiac region and from the walking legs ..... *L. semigranosa.*
    2. Upper border of hand not crested :—
      - a. Crest-like margin of antero-lateral border of carapace simply cleft ..... *L. granulosa.*
      - [b. Crest-like margin of carapace deeply eroded ..... *L. fissa.*]
    - ii. Surface of carapace and of appendages perfectly smooth ..... *L. anaglypta.*
- II. Regions and sub-regions of the carapace so faint as to be visible only on close inspection ; postero-lateral borders remarkably concave, and defined by a row of sharp beads or teeth ..... *L. corallina.*

25. *Lophactæa cristata*, A. Milne Edwards.

*Lophactæa cristata*, A. Milne Edwards, *Nouv. Archiv. du Mus.* I. 1865, p. 246, pl. xvi. fig. 1 : de Man, *Notes Leyden Mus.* III. 1881, p. 95, and *Arch. fur Naturges.* LIII. 1887. i. p. 246 : F. Müller, *Verh. Ges. Basel VIII.* p. 474 : Ortmann, *Semon's Forschungsr.* (Jena. Denkschr. VIII.), Crustacea, p. 50.

Carapace symmetrically intersected by broad smooth rather deep furrows, which delimit and subdivide the regions, the strongly marked convexities of the regions and subregions being closely studded with pearl-like granules : similar, but larger, granules occur in linear series on the outer surface of the wrist and hand ; and similar, but smaller, granules are found on the outer surface of the corresponding segments of the legs. The under surface of the carapace is finely granular and more or less furred.

The whole supra-orbital border is tumid, with a row of pearly granules.

The crest of the antero-lateral border is divided into four broad segments by three narrow fissures.

Upper border of the arm and hand strongly and sharply crested, fingers fluted.



Legs with a few scattered bristles on most of the joints, and with the claws covered with short fur: the upper edge of the merus carpus and propus is strongly crested, as are the lower edges of the merus.

Colours in spirit, yellowish or greenish brown, fingers blackish brown.

One specimen from the Madras coast is in the Indian Museum collection. (There are other specimens from Mauritius).

26. *Lophactæa semigranosa*, (Heller) A. M. Edw.

*Atergatis semigranosus*, Heller, Abhand. zool.-bot. Ges. Wien, XI. 1861, p. 6, and SB. AK. Wien, XLIII. 1861, p. 313.

*Lophactæa semigranosa*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 248: Miers, Zool. H. M. S. Alert, pp. 517 and 527: de Man, Archiv. fur Naturges. LIII. 1887, i. p. 246, pl. viii. fig. 4: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 355: Ortmann, Zool. Jahrb. Syst. VII. 1894, p. 459.

Closely resembles *L. cristata* Heller, from which it is, perhaps, not specifically distinct. It differs chiefly in having the pearly granules not only less sharply sculptured and less closely studded, but quite absent from a part of the post-cardiac region, from the supra-orbital border, and from the outer surface of the walking legs. Its appearance, in short, is that of *L. cristata* with the sculpturing woru.

7 specimens from the Andamans, Mergui, and Ceylon.

27. *Lophactæa granulosa*, Rüppell, A. M. Edw.

*Xantho granulosis*, Rüppell, 24 Krabben roth. Meer. p. 24, pl. v. fig. 3.

*Ægle granulosis*, De Haan. Faun. Japon. Crust. p. 17 (name only).

*Cancer limbatus*, Edw., Hist. Nat. Crust. I. 377, pl. xvi. fig. 14.

*Atergatis limbatus*, Dana, U. S. Expl. Exp. Crust. pt. I. p. 157: Heller, Novara Crust, p. 8: Streets, Bull. U. S. Nat. Mus. VII. 1877, p. 105.

*Lophactæa granulosa*, A. MILNE EDWARDS, NOUV. ARCHIV. DU MUS. I. 1865, p. 247, and IX. 1873, p. 187: Brocchi, Ann. Sci. Nat. (6) II. 1875. Art. 2, p. 71, pl. xvii. fig. 138 (male appendages): Hilgendorf, MB. AK. Berl. 1878, p. 787: de Man, Notes Leyden Mus. III. 1881, p. 95, and Archiv. fur Naturges. LIII. 1887, i. p. 246: Haswell, Cat. Austr. Crust. p. 43: Miers, Challenger Brachyura, p. 114: Cano, Boll. Soc. Nat. Nap. III. 1889, p. 190: J. R. Henderson, Tr. Linn. Soc., Zool., (2) V. 1893, p. 354: Ortmann, Zool. Jahrb. Syst. &c. VII. 1894, p. 459.

Closely resembles the two preceding species, from which it differs most conspicuously in having no crest to the upper border of the hand: the granulation of the carapace is not nearly so sharp-cut and pearl-like. In the Indian Museum are specimens from Australia and Samoa, but none from India. It is included in the Indian Fauna on the authority of Dr. J. R. Henderson.

28. *Lophactæa anaglypta* (Heller), A. M. Edw.

*Atergatis anaglyptus*, Heller, Abhandl. zool.-bot. Ges. Wien, 1861, p. 6, and SB. Ak. Wien, XLIII. 1861, p. 312, pl. ii. figs. 11, 12.

*Lophactæa anaglypta*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 251, and IX. 1873, p. 190: Ortmann, Zool. Jahrb. Syst. VII. 1893, p. 459: de Man, Zool. Jahrb. Syst. VIII. 1895, p. 498.

Carapace with the regions separated and symmetrically subdivided by broad but well cut grooves, but with the texture of the surface—as of the appendages—perfectly smooth, the only roughness of any sort being a few lines and impressions on the outer surface of the hand.

Crest of the antero-lateral border narrow, divided into four lobes by three insignificant notches or dents. Supra-orbital border not tumid throughout its extent. Crest of the upper border of the hand low and rather blunt: crests of the leg-joints distinct but rather low.

One specimen from Galle, one from the Persiau Gulf.

29. *Lophactæa corallina*, n. sp.

Carapace broadly semioval, with remarkably concave postero-lateral borders, the crest of the antero-lateral border very thin and sharp and a little angular, the postero-lateral and posterior borders bounded by a line of sharp beads or teeth. Front obliquely deflexed, with a sharp broadly-bilobed edge.

The whole surface of the carapace is very finely granular, but the division and subdivision of the regions, though undoubtedly existent, is hardly perceptible, so faint are the inter-regional depressions: some long stiff hairs occur here and there.

The under surface of the carapace and the surface of the external maxillipeds and male sternum is finely granular.

The chelipeds and legs are rather hairy and are beautifully sculptured: at the distal end of the arm is a petal-like crest, and three series of larger petaloid granules or crests traverse the outer surface of the wrist longitudinally: the outer surface of the hand is closely granular, the granules becoming linear in arrangement and laminar in form towards the upper part.

The outer surfaces of the legs are covered with granules and teeth, two crests on the carpopodites of all being very distinct.

Colours in spirit, yellowish or whitish with a pink blush: fingers with a black cross-band at the base.

Length of carapace 6 millim., breadth 9 millim.

A male and female from off Ceylon, 34 fms.

30. *Lophactæa fissa*, Henderson.

*Lophactæa fissa*, Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 355, pl. xxxvi. figs. 8, 8a.

It appears to me possible that this, which seems to be founded on a single specimen, is only an individual variation of *L. granulosa*.

*Lophactæa* sp.

From Inglis I. (Andamans) a single small specimen, not agreeing with any described species, which in the circumstances I forbear to describe.

It belongs to the *L. cristata* and *semigranosa* group, but has the inter-regional furrows much shallower and less distinct, and the pearly granules absent from all but the front part of the gastric region and the lateral parts of the epibranchial region: those on the chelipeds are also much fewer and more scattered. The legs are very hairy.

## ZOZYMUS, Leach.

*Zozymus*, Leach, [Dict. Sci. Nat. XII. p. 75. Miers]: and in Desmarest, Consid. Gen. Crust. p. 105.

*Zozymus*, Milne Edwards, Hist. Nat. Crust. I. 383 (part).

*Zozymus*, Dana, U. S. Expl. Exp., Crust. pt. I. p. 189.

*Zozymus*, A. Milne Edwards, Ann. Sci. Nat., Zool., (4) XX. 1863, p. 302.

*Zozymus*, Miers, Challenger Brachyura, p. 134.

Carapace moderately broad, moderately convex in both directions, with the regions well delimited and subdivided into numerous lobules, the surface of which is not usually granular.

The antero-lateral borders are sharp and crest-like, and are cut into lobes (usually four in number); the postero-lateral borders are straight and strongly convergent.

Front about a fourth the greatest breadth of the carapace, obliquely deflexed, grooved and emarginate in the middle line: orbits large, the tumid edge with the three suture lines near the outer angle distinct; eyes on short thick stalks.

Antennules folding nearly transversely, inter-antennular septum broad. Basal joint of antennæ short, touching the front only at the (produced) antero-internal angle; the flagellum short (less than the major diameter of the orbit), lodged in the orbital hiatus.

Merus of the external maxillipeds with the front edge a little oblique.

Chelipeds equal in both sexes; fingers with broad hollowed-out

tips. Long joints of legs with sharp crest-like upper borders much as in *Atergatis*.

Abdomen of the male five-jointed, the 3rd-5th somites being fused. Rather large crabs.

*Key to the Indian species of Zozymus.*

- I. All parts of carapace rugose : inter-regional and inter-lobular furrows smooth and naked except, perhaps, near the margin of the carapace ... .. *Z. aeneus*.
- II. Posterior third of carapace hardly at all rugose : inter-regional and inter-lobular furrows for the most part full of short close hair ... .. *Z. pilosus*.

31. *Zozymus aeneus*, (Linn.)

*Cancer incomparibilis*, Seba, Thesaurus III. 48, pl. xix. fig. 18.

*Cancer aeneus*, Linn., Mus. Lud. Ulr. p. 451, and Syst. Nat. (ed. xii) p. 1048.

*Cancer floridus*, Herbst, Krabben, I. ii. 132, 264, pl. iii. fig. 39, pl. xxi. fig. 120.

*Cancer amphitrite*, Herbst, Krabben, III. ii. 5, pl. liii. fig. 1.

*Cancer aeneus* and *floridus*, Fabricius, Ent. Syst. II. 455, 445, and Suppl. p. 335, 338.

*Cancer aeneus*, Latreille, Hist. Nat. Crust. V. 375 : Lamarck, Hist. Nat. Anim. sans Verteb. V. 271 : Desmarest, Consid. Gen. Crust. p. 104 : [Quoy et Gaimard, Voy. Uranie, pl. lxxvi. fig. 1. Edw.].

*Zozymus aeneus*, Milne Edwards, Hist. Nat. Crust. I. 385.

*Aegle aeneus*, De Haan, Fann. Japon. Crust. p. 17.

*Zozymus aeneus*, Dana, U. S. Expl. Exp. Crust. pt. I. p. 192, pl. x. fig. 3 : Stimpson, Proc. Ac. Nat. Sci. Phila. 1858, p. 32 : Heller, SB. AK. Wien, XLIII. 1861, p. 326 : A. Milne Edwards, in Maillard's Île Réunion, Annexe F. p. 4, and Nouv. Archiv. du Mus. IX. 1873, p. 207 : Miers, Ann. Mag. Nat. Hist. (5) II. 1878, p. 407, and Phil. Trans. Vol. 168, 1879, p. 486, and Ann. Mag. Nat. Hist. (5) V. 1880, p. 234, and Challenger Brachyura, p. 134 : Richters in Möbins Meeresf. Maurit. p. 146 : Haswell, Cat. Austral. Crust. p. 58 : F. Muller, Verh. Ges. Basel VIII. p. 474 : de Man, Archiv. fur Naturges. LIII. 1887, i. p. 273 : Cano, Boll. Soc. Nat. Napoli III. 1889, p. 199 : J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 359 : Ortmann, Zool. Jahrb. Syst. VII. 1893-94, p. 458, and Semon's Forschungr. (Jena. Denk. VIII) Crust. p. 50 : Whitelegge, Mem. Austral. Mus. III. 1897, p. 131.

Carapace with the regions well delimited and very strongly rugose, the rugosities being small in the postero-lateral regions but everywhere smooth and polished, and everywhere symmetrical. The crest-like antero-lateral borders are 4-scalloped, the three anterior lobes being rounded and the fourth being dentiform.

The tumid orbital margins are marked by four suture lines. The front hardly projects beyond the level of the orbit.

The wrist has its outer surface made rugose by meandering furrows, one of which runs fore and aft, the others transversely. The

hand carries a blunt but well-marked crest along its upper border, below which the surface is rugose much as the wrist: the lower part of the outer surface of the hand is tuberculous, the tubercles tending to a linear arrangement. The fingers are fluted, bear strong molariform teeth and tufts of hair on their cutting edge, and have blunt-pointed, hollowed out (spoon-like) tips. The furrows of the wrist and hands, as well as those of the legs, are filled with close short fur.

The merus carpus and propus have the upper edge strongly carinate, the inner surface of each crest bearing a thick fringe of long somewhat silky hair: the dorsal surface of these joints is furrowed longitudinally, with many more or less plain transverse impressions also: the dactyli are hairy up to the claw.

In life the animal is beautifully spotted and ocellated with chocolate brown on a bluish-grey ground. In spirit the animal has a chinaware look and a dull yellowish-white colour, with darker yellow and dull brownish spots and markings.

In the Indian Museum are 30 specimens from the Andamans and Laccadives.

### 32. *Zozymus pilosus*, A. Milne Edwards.

*Zozymus pilosus*, A. Milne Edwards, Ann. Soc. Ent. France (4) VII. 1867, p. 271; and Nouv. Archiv. du Mus. IX. 1873, p. 208, pl. vii. fig. 2.

Carapace having the regions and lobules well defined in its anterior two-thirds only: the lobules have a flattened semi-imbricate look, wavy edges, and a rough or granular surface; and the grooves that separate them are filled with small short close-set bristles, especially along the anterior contours of the lobules.

All four lobes of the antero-lateral borders are rounded and not dentiform. The orbital margin is not very tumid and is marked by three suture lines. The front projects beyond the orbit.

The wrist and hand are closely nodular: the nodules (those on the hand especially) have a granular surface, and the grooves that separate them are full of short close hair: the upper edge of the hand is not crested. Fingers short, stout, blunt-pointed, hollowed at tip: they are strongly fluted, the ridges being beaded in their basal half.

The legs have the upper edge of the merus, carpus, and propodite strongly crested: the crest of the merus and carpus may be subserrate, and is always notched near the distal end. The dorsal surface of the carpus and propodite is grooved and nodular—the nodules having a flat, subimbricate look.

Colours in spirit—yellowish-white, with a faint bluish or purplish blush; the crest-like margin of the carapace lighter than other parts; fingers dark brown with white tips.

In the Indian Museum is a specimen from Port Blair Harbour (Andamans), and one from the Angrias Bank (Malabar Coast) in 15 fms.

Although the chelipeds and antero-lateral margins make this species easily recognizable from *Lophozozymus incisus* (Edw.) de Man, I am inclined to suspect that this is the young of *L. incisus*.

#### LOPHOZOZYMUS, A. Milne Edwards.

*Lophozozymus*, A. Milne Edwards, Ann. Sci. Nat., Zool., (4) XX. 1863, p. 276; and Ann. Soc. Entom. France (4) VII. 1867, p. 272.

*Lophozozymus*, Miers, Challenger Brachyura, p. 114.

Differs from *Zozymus* in having (1) the crest of the antero-lateral border sharp-edged and (2) the fingers not spooned at tip. To avoid unnecessary disturbance of accepted nomenclature the name is here maintained as a subgenus of *Zozymus*.

#### *Key to the Indian species of the subgenus Lophozozymus.*

- I. Front lobe of the antero-lateral border confluent and fused with the orbit: [size moderate or small]:—
  - . Regions and lobules of carapace well defined; the lobules pitted or dented, the grooves between them hairy: chelipeds and legs shaggy ..... *L. incisus*.
  - i. Regions and lobules of carapace ill defined and faint: surface of carapace smooth and bare: legs with a few lank scattered hairs ... ..... *L. dodone*.
- II. Front lobe of antero-lateral border separated from the orbit by a gap; carapace smooth, the regions (but not the subregions) fairly well defined: [size large]:—
  - i. Hands smooth and bare ... ..... *L. octodentatus*.
  - ii. Outer surface of hand granular and hairy ..... *L. cristatus*.

#### 33. *Lophozozymus octodentatus*, Edw.

*Cancer saxatilis*, Rumph, Amboinsch. Rariteitk. p. 9, pl. v. fig. M.

*Cancer rumphii*, Guérin, Icon. Règne An. pl. ii. fig. 1, (nec Herbst.)

*Xantho octodentatus*, Milne Edwards, Hist. Nat. Crust. 1. 398: Lucas in Jâcquinot's Voyage Astrolabe, Zool., Crust., p. 23, pl. ix. fig. 1: E. Nauck, Zeits. Zool. XXXIV. 1880, p. 51 (*gastric teeth*): Haswell, Cat. Austral. Crust. p. 58.

*Lophozozymus epheliticus* Linn., Miers, Ann. Mag. Nat. Hist. (5) V. 1880, p. 231, and Zool. H. M. S. Alert, pp. 182, 207: A. O. Walker, Journ. Linn. Soc., Zool., XX. 1890, p. 109: de Man, Zool. Jahrb., Syst., VIII. 1895, p. 518.

Carapace perfectly smooth and polished; the gastric region delimited on all sides and partly subdivided, and the hepatic separated from the branchial regions, by broad smooth shallow depressions. Underside of carapace hairy.

Front gently convex beyond the orbits, finely cleft in the middle line. Orbital border sharp, somewhat puckered by three sutures near the outer angle. The crest-like antero-lateral border is sharp and is cut into four teeth, of which the first is separated from the orbit by a gap, the third and fourth are keeled, and the third strongly acuminate.

Chelipeds equal, their surface perfectly smooth: the upper edge of the arm is strongly crested, the crest at its distal end being foliaceously expanded and deeply cleft; wrist with a strong double tubercle at its inner angle; upper edge of hand crested, but rather coarsely; fingers large, long, pointed.

Legs smooth: upper edge of merus carpus and propodite strongly crested, the inner face of the crest with tufts of long hair; dactylus furred up to the claw.

Colours in spirit: a bright orange-red network on a dull yellow-ochre ground, fingers black.

In the Indian Museum are two specimens from Singapore.

#### 34. *Lophozozymus cristatus*, A. Milne Edwards.

*Lophozozymus cristatus*, A. Milne Edwards, Ann. Soc. Entom. France (4) VII. 1867, p. 272, and Nouv. Archiv. du Mus. IX. 1873, p. 203, pl. vi. fig. 4: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 361: Ortman, Zool. Jahrb., Syst., VII. 1893-94, p. 456.

This species appears to differ from *L. octodentatus* only in having the first lobe or tooth of the antero-lateral margin acute instead of rounded and the outer surface of the hands granular and hairy.

There are no specimens in the Indian Museum; and the species—if it be distinct—is included in the Indian fauna on the authority of Dr. J. R. Henderson.

#### 35. *Lophozozymus incisus* (Edw.) Haswell, de Man.

*Xantho incisus*, Milne Edwards, Hist. Nat. Crust. I. 397: Hess, Archiv. f. Nat. XXXI. 1865, i. p. 133: F. Muller, Verh. Ges. Basel, VIII. 1886, p. 474.

? *Xantho superbus*, Dana, Proc. Ac. Nat. Sci. Philad. 1852, p. 74, and U. S. Expl. Exp. Crust. pt. I. p. 167, pl. viii. figs. 5a-b, (nec A. Milne Edwards) de Man.

*Lophozozymus incisus*, Haswell, Cat. Austral. Crust. p. 58: de Man, Archiv. für Naturges. LIII. 1887, i. p. 268, pl. x. fig. 1: Thallwitz, Abh. u. Ber. Mus. Dresden, 1890-91, no. 3, p. 48.

Carapace with the regions well delimited, and having the branchial regions (and to a less extent, the gastric region also) subdivided into lobules which have their anterior margins sinuous and sharply undermined so as to have a semi-imbricate look. The surface of these lobules is a little dented and uneven, and the grooves that separate them are full of hair.

The crest-like antero-lateral border is cut into 4 lobes, of which the first is confluent with the orbit, and the last two are pointed and strongly keeled. Front little convex beyond the orbits, distinctly bilobed. Orbital border sharp, salient, with three suture-lines.

Chelipeds equal: upper edge of arm with a strong crest, which is foliaceously expanded and cleft at its distal end; upper border of hand and dactylus crested; outer surface of wrist and hand covered with large granules, which stand in more or less distinct linear series and are a good deal concealed by long shaggy hairs. Fingers stout, of good length, pointed.

Legs with the upper edge of merus carpus and propodite strongly crested and shaggy, and the surfaces of the dactylus and of most of the propodite shaggy.

Colours in spirit yellow with many orange-red patches; fingers dark brown.

In the Indian Museum are 2 specimens, one from the Orissa Coast, 15-35 fms., the other from the Angrias Bank (Malabar Sea) 15 fms.

### 36. *Lophozozymus dodone* (Herbst) Hilgendorf, de Man.

*Cancer dodone*, Herbst, Krabben, III. ii. 37, pl. lii. fig. 5.

*Lophozozymus dodone*, Hilgendorf, MB. Ak. Berl. 1878, p. 789; Miers, Zool. H. M. S. Alert, pp. 517, 527; de Man, Archiv. für Naturges. LIII. 1887, i. p. 270, pl. x. figs. 2, 2a; J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 361; Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 457.

*Xantho radiatus* (? *C. dodone* Herbst) Milne Edwards, Hist. Nat. Crust. I. 398; A. Milne Edwards, in Maillard's Île Réunion, Annexe F. p. 4.

*Atergatis lateralis*, White P. Z. S. 1847, p. 225; Ann. Mag. Nat. Hist. (2) II. 1848, p. 285; and Samarang Crust. p. 39, pl. viii. fig. 1.

*Xantho lamelligera*, White, U. cc. p. 225, p. 285, p. 40 (*vide* A. Milne Edwards *infra*).

*Xantho nitidus*, Dana, Proc. Ac. Nat. Sci. Phila. 1852, p. 74, and U. S. Expl. Exp. Crust. pt. I. p. 166, pl. viii. figs. 4a-b.

*Atergatis elegans*, Heller, Novara Crust. p. 7, pl. i. fig. 4 (*vide* de Man).

*Lophozozymus radiatus*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 206.

Carapace smooth with the regions very faintly indicated and with very few and faint traces of lobulation: sometimes a few lank hairs on the antero-lateral border.

The crest-like antero-lateral border is trenchant and somewhat cockled, and is cut into 4 shallow scallops, the last two of which are acuminate and carinate, and the first of which is confluent with the orbit. Front slightly convex beyond the orbits and a little emarginate in the middle line. Orbital border sharp with the suture lines faint and indistinct.



Chelipeds equal; outer surface of wrist and hand finely granular or rugose under the lens; upper edge of arm crested but not foliaceously expanded; both upper and lower edge of hand crested. Fingers very short and stumpy, pointed.

Legs smooth: upper edge of merus carpus and propodite crested and having a few scattered hairs; also a few scattered hairs on the surface and lower edge of propodites.

Colours in spirit yellow, with diffused orange-red patches; fingers brown, white at tip.

In the Indian Museum are three specimens from the Andamans.

### Alliance III. *Euxanthoidea.*

*Euxanthus.*      *Hypocoelus.*

#### EUXANTHUS, Dana.

*Euxanthus*, Dana, Silliman's Amer. Journ. Sci. and Art. (2) XII. 1851, p. 125; Proc. Ac. Nat. Sci. Phila. 1852, p. 75; and U. S. Expl. Exp. Crust. pt. I. p. 173.

*Melissa*, Strahl, Archiv. fur Naturges. XXVII. 1861, i. p. 101.

*Euxanthus*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 289.

Carapace very broad, strongly convex in both directions, with the regions well delimited and subdivided into convex lobules.

The antero-lateral borders are sharp and somewhat irregularly scalloped, the lobes often subpyramidal or dentiform: they do not terminate at the orbit, but are prolonged, beneath the orbit, to the buccal cavern. The postero-lateral borders are very short and very concave.

The front is of no great breadth (about a fifth the greatest breadth of the carapace), bilobed, and prominent. The supra-orbital border and the inner angle of the lower border of the orbit are tumid, and the rest of the orbital margin is very low and forms an unbroken curve, with only one closed suture line. The eyes have short thick stalks.

The antennules fold nearly transversely. The basal antennal joint is prolonged right into the orbit, and the short flagellum is therefore placed inside the orbit. The outer border of the merus of the external maxillipeds is oblique.

The chelipeds are equal in both sexes, and are relatively small and light. The fingers are rather long-pointed, and have the tip slightly but distinctly hollowed out.

Abdomen of the male five-jointed, the 3rd-5th somites being fused.

Crabs of medium size, easily recognized by the peculiar form of the basal joint of the antennæ and the course of the antero-lateral margin of the carapace.

*Key to the Indian species of Euxanthus.*

1. Lobules of carapace almost smooth; outer angle of orbit not marked by a denticle ..... *E. melissa.*
2. Lobules of carapace rough; outer angle of orbit marked by a denticle ..... *E. sculptilis.*

37. *Euxanthus melissa*, (Herbst).

*Cancer exsculptus*, Herbst, Krabben, I. ii. 265, pl. xxi. fig. 121.

*Cancer melissa*, Herbst, Krabben, III. ii. 7, pl. li. fig. 1.

*Euxanthus melissa*, Stimpson, Proc. Ac. Nat. Sci. Phila. 1858, p. 33: A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 293: Targioni Tozzetti, Magenta Crust. p. 27, pl. iii. figs. 1-7: F. Muller, Verh. Ges. Basel, VIII. p. 474: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 359: Ortman, Zool. Jahrb. Syst. VII. 1893-94, p. 466, pl. xvii. fig. 9.

*Cancer mamillatus*, Milne Edwards, Hist. Nat. Crust. I. 376.

*Melissa mamillata*, Strahl, Archiv. für Naturges. XXVII. 1861, i. p. 103.

*Euxanthus mamillatus*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 292, pl. xv. figs. 2-2b; and IX. 1873, p. 196: Haswell, Cat. Austral. Crust. p. 48: de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 30.

*Euxanthus nitidus*, Dana, Proc. Ac. Nat. Sci. Phila. 1852, p. 75; U. S. Expl. Exp., Crust. pt. I. p. 174, pl. viii. figs. 9a-b. (young).

*Melissa nitida*, Strahl, Archiv. für Naturges. XXVII. 1861, i. p. 103.

*Cancer exsculptus*, Hoffmann in Pollen and Van Dam, Faun. Madagasc. Crust. p. 38.

?*Euxanthus exsculptus* var. *rugosus*, Miers, Zool. H. M. S. Alert, pp. 517, 527 (? young.)

The lobules of the carapace are extremely convex, and though some of them may be a little dimpled, especially in the young, they are commonly smooth.

The antero-lateral borders are cut into five teeth, but there is often a tubercle—which may be incompletely double—between the 4th and 5th teeth; between the 3rd and 5th teeth the margin is finely granular.

The curve of the orbit is unbroken by any denticle at the outer angle, and is smooth, not granular.

The outer surfaces of the wrist and hand, as of the corresponding joints of the legs, are nodular, the nodules and the hollows between them being smooth: on the lower outer surface of the hand are two longitudinal wrinkles which also have a smooth surface. The fingers have their surfaces smooth, and their cutting edges strongly toothed, with the tip distinctly hollowed out.

Colours of good spirit specimens: stone grey or yellowish, with numerous tiny chocolate-brown or purplish specks, and some large blotches of the same colour on the gastric, hepatic and branchial regions. These markings have faded in spirit specimens that have been preserved

over ten years. Fingers blackish brown, this colouration extending along the lower border and inner surface of hand.

In the Indian Museum are 17 specimens from the Andamans, Mergui, and Ceylon (besides a specimen from Samoa).

### 38. *Euxanthus sculptilis*, Dana.

*Euxanthus sculptilis*, Dana, Proc. Ac. Nat. Sci. Philad. 1852, p. 75, and U. S. Expl. Exp. Crust. pt. I. p. 173, pl. viii. figs. 8a-d: A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 291: Ortmann, Zool. Jahrbuch., Syst., VII., 1893-94, p. 466.

*Cancer huonii*, Lucas in Jacquinot's Voy. Astrolabe, Crust. p. 16, pl. iv. fig. 1.

*Euxanthus huonii*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 290, pl. xv. figs. 1-1c: Haswell, Cat. Austral. Crust. p. 47: Miers, Zool. H. M. S. Alert, pp. 182, 204: de Man, Archiv. für Naturges. LIII. 1887, i. p. 263.

Lobules of carapace moderately convex, their surface so much wrinkled and dented transversely as to give them an almost scaly look.

Antero-lateral borders cut into six teeth, the edge between all the teeth being granular.

The orbital margin is granular, and there is a denticle to mark the outer angle of the orbit.

The nodules of the wrists and hands—and, to a less strongly marked extent, those of the corresponding joints of the legs—are granular, as are the hollows between the nodules; and the two wrinkles along the lower outer surface of the hand are granular. The fingers resemble those of *E. melissa*, except that their surfaces are strongly granular.

Colours of well-preserved spirit specimens: yellowish with purplish spots and blotches, many of which are confluent; fingers and hand coloured as in *E. melissa*.

In the Indian Museum are 3 specimens from Persian Gulf and Andamans, (besides one from Samoa).

### HYPOCÆLUS, Heller.

*Hypocælus*, Heller, Abh. zool-bot. Ges. Wien, 1861, p. 7; and SB. AK. Wien, XLIII. 1861, p. 319.

*Hypocælus*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865. p. 295.

Differs from *Euxanthus* chiefly in having a large oval or reniform cavity excavated in either pterygostomial region.

It is not represented in the Indian Museum.

### 39. *Hypocælus rugosus*, Henderson.

*Hypocælus rugosus*, Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 358, pl. xxxvi. figs. 9-11.

Alliance IV. *Xanthoida.*

Xantho.	Etisus.	Orphnoxanthus.
Leptodius.	Etisodes.	
Medæus.		
Cycloxanthus.		
Hoploxanthus.		

## XANTHO, Leach.

*Xantho*, Leach, Malac. Pod. Britt. pl. xi and text, 1815; and Trans. Linn. Soc. XI. 1815, p. 320.

*Xantho*, Desmarest, Consid. Gen. Crust., p. 104.

*Xantho*, (part) and *Eudora* (part), De Haan, Faun. Japon. Crust. pp. 18 and 22.

*Xantho*, (part) Milne Edwards, Hist. Nat. Crust. I. 387.

*Xantho*, (part) Dana, U. S. Expl., Exp., Crust. pt. I. p. 166.

*Xantho*, A. Milne Edwards, Ann. Sci. Nat., Zool., (4) XX. 1863, pp. 275 and 294 and Miss. Sci. Mex., Crust. p. 251.

*Xantho*, Miers, Challenger Brachyura, p. 124.

## [Type XANTHO FLORIDUS, Leach.]

Carapace broad, moderately convex anteriorly, flat in the posterior half; the regions generally well delimited and fairly well lobulated in the anterior two-thirds, but not posteriorly.

Antero-lateral borders arched, usually cut into four teeth or lobes: postero-lateral borders moderately convergent, not concave.

Extent of fronto-orbital border half, or less than half, the greatest width of the carapace: front about a fourth the greatest breadth of the carapace.

Front little deflexed, rather prominent, usually sublaminar, notched in the middle line, usually separated from the supra-orbital margin by a notch or groove.

Orbital margin with two (often indistinct) suture lines above and one (more distinct) just below the outer angle: usually a prominent tooth at the inner angle of the lower edge of the orbit. Eyes on short thick stalks.

Basal antennal joint short, meeting the front at the inner angle: the flagellum, which is about as long as the orbit, lodged in the orbital hiatus.

Anterior edge of merus of external maxillipeds nearly transverse, with commonly a small tooth near the antero-internal angle.

Chelipeds either unequal in both sexes, or less commonly equal in both sexes (*Xantho impressus*, *Xantho scaberrimus*); fingers pointed.

Legs subcylindrical, with the upper edges often sharp (crested in *Xantho scaberrimus*.)

Abdomen of male five-jointed, the 3rd-5th somites fused; (in *X. impressus* the sutures are so distinct that the abdomen may appear 7-jointed).

*Key to the Indian species of the Genus Xantho.*

I. Chelipeds equal, or almost equal, in both sexes:—

i. *Legs crested*, the crest sharp, or serrate, or crenate: length of carapace a good deal more than two-thirds the greatest breadth: lobules of carapace covered with convex subsquamiform tubercles ..... *Xantho (Lophoxanthus) scaberrimus.*

ii. *Legs thick*, sub-cylindrical, length of carapace less than two-thirds the greatest breadth: lobules of carapace smooth ..... *Xantho (Eudora) impressus.*

II. Chelipeds unequal in both sexes: length of carapace two-thirds, or a little more than two-thirds, the greatest breadth: the 'legs may have sharp, but never distinctly crested edges:—

i. *First two teeth of the antero-lateral margin faint, obsolescent*; carapace and chelipeds smooth (non-granular)..... *Xantho bidentatus.*

ii. *Either the last three, or all four, teeth of the antero-lateral margin distinct*; a large part of the carapace and of the exposed surfaces of the chelipeds wrinkled and granular ..... *Xantho distinguendus.*

40. *Xantho distinguendus*, De Haan.

*Cancer (Xantho) distinguendus*, De Haan, Faun. Japon. Crust. p. 48, pl. xiii. fig. 7: Heller, SB. Ak. Wien, XLIII. 1861, p. 323.

*Chlorodius distinguendus*, Stimpson, Proc. Ac. Nat. Sci. Phila., 1858, p. 34.

*Xantho macgillivrayi*, Miers, Zool. H. M. S. Alert, pp. 183, 211, pl. xx. fig. c.

*Lophozozymus (Lophoxanthus) bellus*, var. *leucomanus*, Miers, Challenger Brachyura, p. 115, pl. xi. fig. 1.

*Medæus distinguendus*, de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 31: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 359.

Regions of carapace well delimited, fairly well divided into lobules: the anterior and lateral parts of the carapace are covered with granular transverse wrinkles which have almost a scaly look.

Front cleft into two rather prominent, square-cut, sub-laminar lobes. Antero-lateral margin cut into four sharply granular teeth, which may be all sharply acuminate, or the first may sometimes be rather indistinct.

The under surface of the carapace, below and external to the orbit is, like the first lobe of the antero-lateral margin, eroded and granular.

Chelipeds unequal in both sexes: upper part of the outer surface of arm with some fine transverse granular wrinkles; upper and outer surface of wrist and hand closely granular, the wrist and the upper part of the hand being also eroded or pitted, most usually in a peculiar honey-comb fashion; fingers stout, fluted.

Legs rather thin: upper edge of merus sharp (almost subcristi-form), often finely granular: carpus and propodite usually grooved and ridged longitudinally (the propodite most distinctly so, and on both surfaces): dactylus covered with close short fur. The sculpture of the carpus and propodite, as of the chelipeds, is variable, even in specimens from the same locality.

Abdomen of male 5-jointed, the sutures between the 3rd-5th somites nearly or quite obliterated.

Colours in spirit: light yellow, fingers blackish brown with whitish tips.

In the Indian Museum besides specimens from Hongkong, there are 16 specimens from Mergui, Persian Gulf, and Karáchi. Fourteen little specimens from the Malabar Coast, 28 fms., are also probably referable to this species.

If this species is to be removed to *Medæus* on account of the erosion and consequent indefiniteness of the orbital end of the antero-lateral margin, *Xantho floridus* and more certainly *Xantho tuberculatus* must share the same fate, and *Medæus* must then be absorbed in *Xantho*.

#### 41. *Xantho bidentatus*, A. Milne Edwards.

*Xantho bidentatus*, A. Milne Edwards, Ann. Soc. Ent. France (4) VII. 1867, p. 266: Miers, Challenger Brachyura, p. 126, pl. xi. fig. 4: Ortmann, Zool. Jahrb. Syst., VII. 1893-94, pp. 444, 449.

Surface of carapace and appendages smooth (non-granular): gastric region well defined by fine shallow grooves, and very faintly lobulated: branchial regions imperfectly separated from the hepatic regions and very faintly and imperfectly areolated.

Of the four lobes of the antero-lateral margin the first two are faint, broadly-rounded and coalescent, and the last two possess a small acumination.

Front prominent, notched in the middle line, to form two lobes, which have the edge a little concave and the outer angle well pronounced.

Under surface of carapace smooth to naked eye: the side wall above the articulations of the legs hairy.

Chelipeds unequal in both sexes, smooth like the legs.

Abdomen of male five-jointed.

Colours in spirit: dull yellowish brown, fingers almost black.

In the Indian Museum are four specimens from the Andamans.

#### 42. *Xantho impressus*, (Lamk.) Edw.

*Cancer impressus*, Lamarck, Hist. Nat. Anim. sans. Vertebr. V. 272.

*Xantho impressus*, Milne Edwards, Hist. Nat. Crust. I. 393: A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 198, pl. vi. fig. 2: F. Muller, Verh. Ges. Basel VIII. 1886, p. 474: de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 30: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 359: Ortman, Zool. Jahrb., Syst. VII. 1893-94, pp. 444, 449.

*Eudora impressa*, De Haan, Faun. Japon. Crust., p. 23: A. Milne Edwards in Maillard's Île Réunion, Annexe F. p. 4: Richters in Möbius Meeresf. Maurit. p. 146, pl. xv. figs. 15, 16.

Carapace very short and broad, little convex in the anterior half, quite flat in the posterior half.

Gastric and cardiac regions separated from the wings of the carapace by very broad and deep furrows, the wings of the carapace being thrown into massive smooth lobules by furrows not quite so deep, but the gastric region being slightly and imperfectly areolate except quite anteriorly.

Front somewhat declivous, bilobed, not laminar. The four lobes of the antero-lateral margin are thickened and blunt, the first lobe being on a level lower than that of the orbit. Close in front of the thickened posterior border is a smooth transverse wrinkle.

The tooth and notch at the antero-internal angle of the merus of the external maxillipeds are very distinct.

Chelipeds equal in both sexes: outer surface of arm with a groove following the contour of the distal border; outer surface of wrist with a faintish Y-shaped dimple, and a strong double-crowned tubercle at the inner angle of the wrist; upper surface of hand with an incomplete, longitudinal, pitted furrow; fingers with cutting-edge coarsely crenulate.

Legs thick, subcylindrical, smooth; both edges of the dactylopodites covered with thick short fur.

Abdomen of male 5-jointed, with the sutures between the 3rd-5th joints persistent.

Colours in spirit: waxy white, fingers blackish brown. The whole animal has a smooth waxy look.

In the Indian Museum are two specimens, from Mergui and the Andamans (besides three from Mauritius.)

This is a curious form, connecting *Xantho* with several other genera.

## Sub-genus LOPHOXANTHUS, A. Milne Edwards.

*Lophoxanthus*, A. Milne Edwards, Miss. Sci. Mex. Crust. p. 256.

Differs from typical *Xantho* (*Xantho floridus* etc.) chiefly in having at least the upper edge of the legs distinctly crested: the carapace, moreover, is longer and narrower.

43. *Xantho* (*Lophoxanthus*) *scaberrimus*, Walker.

*Xantho scaberrimus*, A. O. Walker. Journ. Linn. Soc., Zool., XX. 1886-90, pp. 109, 115, pl. vii, figs. 1-4.

Carapace about  $\frac{7}{5}$  as long as broad, moderately convex in the anterior two-thirds; regions and subregions strongly defined by broad deep smooth channels, convex, and covered with smooth well-defined tubercles that are pea-like in the posterior third, somewhat scale-like in the anterior two-thirds, and pointed along the antero-lateral border.

Fronto-orbital border less than half the width of the carapace: front two-lobed, the lobes having an oblique and slightly concave margin and a well-defined external angle.

Antero-lateral border four-lobed, the first lobe blunt and non-prominent, the other three prominent and acuminate, all four with the edges serrulate. Postero-lateral margin not concave, granular; posterior margin beaded.

The whole under surface of the carapace, and the surfaces of the external maxillipeds, male sternum and male abdomen, are closely covered with large granules.

Chelipeds equal, uniformly closely covered (except upper surface of arm and inner and outer surfaces of fingers) with sharpish tubercles, which are largest on the hand, where they fall into raised longitudinal parallel series, most marked on the lower part of the outer surface: fingers fluted in continuation of the ridges on the hand, the ridges of the dactylus being rough in their basal part. Two tubercles, the anterior of which is the larger, at the inner angle of the wrist: and two somewhat foliaceous excrescences terminating the crest-like upper edge of the arm.

First three pairs of legs with the edges of the merus (but especially the upper edge) sharply crested, the upper edge of the carpus and propodite strongly serrated, and the dorsal surface of the carpus and propodite furnished with squamiform granules in series parallel with this serrated crest. The last pair of legs resembles the others, except that the crest of the merus is serrated, and the dorsal surface of the merus is granular.

Colours in spirit uniform ashy white.



In the Indian Museum besides a specimen from Japan is one from off the Orissa coast, 11 fms.

*Xantho (Lophoxanthus) scaberrimus* var. *baccalipes*.

Differs from the type in the following particulars:—

(1) the characteristic tubercles have everywhere a worn appearance, especially in the middle of the carapace and on the chelipeds and the ischium of the external maxillipeds:

(2) the dorsal crest of the arm and of the meropodites of the legs have each become a row of berry-like teeth, and the serrated crest and granular ridges of the carpopodites and propodites of the legs have become merely low rough elevations.

In the Indian Museum are three large males from Ceylon: the largest has the carapace 47 millim. long and 61 millim. broad.

*Xantho (Lophoxanthus) scaberrimus* var. *cultripes*.

Differs from the type in the following particulars:—

(1) the characteristic tubercles are still more "worn," especially on the mesogastrium, and near the inner angle of the wrist, and near the base of the thumb, where they are almost worn away:

(2) the dorsal crest of the arm (with its foliaceous terminal lobes), and the crests of the merus carpus and propodite in all the legs, are greatly developed sharp and entire, and the raised rows of granules on the dorsal surfaces of the leg joints have almost disappeared.

In the Indian Museum is a single male from Singapore, with a carapace 50 millim. long and 64 broad.

Sub-genus LEPTODIUS, A. Milne Edwards.

*Leptodius*, A. Milne Edwards, Ann. Sci. Nat., Zool., (4) XX. 1863, p. 284: Nouv. Archiv. du Mus. IX. 1873, p. 221: Miss. Sci. Mex., Crust. p. 267, *ubi synonym.*

*Leptodius*, Miers, Challenger Brachyura, p. 136.

*Leptodius* (e.g. *Leptodius exaratus*) resembles *Xantho* (e.g. *Xantho floridanus*) in general form and proportions, but differs most conspicuously in having the fingers hollowed out "*en cuillère*" at tip. But this divergence is almost bridged by *Leptodius crassimanus*, in which the spooning of the fingers is indistinct.

*Leptodius* further differs from the type of *Xantho* (1) in the greater convergence of the postero-lateral borders, (2) in the often—but not always—more than four-lobed antero-lateral border, and (3) in the often more extensive contact of the basal antennal joint with the front.

*Key to the Indian species of the sub-genus Leptodius.*

- I. Carpus (and sometimes the propodite also) of the four last pairs of legs strongly bicarinate dorsally—the crests enclosing a trough-like cavity ..... *L. cavipes.*
- II. Carpus and propodite of last four pairs of legs normal:—
- i. Four teeth (exclusive of the orbital angle) on the antero-lateral border: postero-lateral border not or hardly shorter than the chord of the antero-lateral border ..... *L. exaratus.*
- ii. More than four teeth on the antero-lateral border: postero-lateral border distinctly shorter than the chord of the antero-lateral border:—
1. Front bilaminar, the lobes having a slightly concave edge: 5 teeth on the antero-lateral margin ..... *L. sanguineus.*
2. Front bilaminar, the lobes so deeply concave as to make the front almost quadridentate:—
- a. Five teeth on the antero-lateral margin: finger-tips often rather indistinctly hollowed out:—
- a. Carapace cut up into numerous strongly convex lobules: upper surface of wrist and hand strongly and sharply rugose and nodular..... *L. euglyptus.*
- β. Lobules of carapace not very numerous, not very convex, smooth: upper surface of wrist and hand somewhat rough ... *L. crassimanus.*
- b. Eight to ten irregular teeth on the antero-lateral margin ..... *L. nudipes.*

44. *Xantho (Leptodius) exaratus* (Edw.) A. M. Edw.

*Chlorodius exaratus*, Milne Edwards, Hist. Nat. Crust. I. 402; and in Cuvier Règne An. Crust. pl. xi. fig. 3: Dana, Proc. Ac. Nat. Sci. Philad. 1852, p. 79; and U. S. Expl. Exp. Crust. pt. I. p. 208: Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 34.

*Leptodius exaratus*, A. Milne Edwards, Nouv. Archiv. du Mus. IV. 1868, p. 71; and IX. 1873, p. 222: Kossmann, Reise roth. Meer. Crust. p. 32, pl. ii. fig. 1-6: Hilgendorf MB. Ak. Berl. 1878, p. 790: Richters in Möbius Meeresf. Maurit. p. 148: Haswell, Cat. Austral. Crust. p. 60: Miers, Zool. H. M. S. Alert, pp. 183 and 214: de Man, Archiv. f. Naturges. LIII. 1887, i. p. 285, and Journ. Linn. Soc., Zool., XXII. 1887-88, p. 33; and in Weber's Zool. Ergebn. Niederl. Ost. Ind. II. 1892 p. 278, and Zool. Jahrb., Syst., VIII. 1894-95, p. 521: Cano, Boll. Soc. Nat. Napoli, III. 1889, p. 202: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 362; Whitelegge, Mem. Austral. Mus. III. 1897, p. 137.

*Xantho affinis*, De Haan, Faun. Japon. Crust. p. 48, pl. xiii. fig. 8: Krauss, Sudafr. Crust. p. 30.

*Xantho lividus*, De Haan, *O.c., l.c.* fig. 6: Miers, Zool. H. M. S. Alert, pp. 183, 214.

*Cancer inæqualis*, Audouin and Savigny Descr. Egypte pl. v. fig. 7 (*vide* A. M. E.)

*Xantho exaratus* var. *typica*, Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 445: and in Semon's *Forschungs.* (Jen. Denk. VIII) Crust. p. 50.

Carapace moderately broad, moderately convex in the anterior two-thirds, nearly flat in the posterior third, where also it is not areolated. Gastric region well-defined, convex, fairly well areolated anteriorly, the wings of the carapace on either side of it divided into about 5 low lobules, three of which follow the contour of the antero-lateral border. The surface of the carapace is non-granular, except sometimes in the young.

Front not very prominent, but projecting beyond the inner angle of the orbit, from which it is separated by a notch; bilaminar, the lobes cut square, but with a slightly concave margin.

Antero-lateral border cut into 4 acuminate teeth, not including the outer angle of the orbit, or a small denticle below it. Postero-lateral border equal in length to the chord of the antero-lateral border.

Side wall of carapace, edges of upper surface of arm, and edges of legs—but especially the upper edge of the meropodites—with a good deal of hair.

Chelipeds unequal in both sexes. Upper and outer surface of wrist more or less dimpled or wrinkled; a strong tubercle at inner angle of wrist. Hands usually smooth, but the upper surface has, very commonly, some low fine transverse or reticulating wrinkles. Fingers large, thick, more or less fluted, not strongly toothed, meeting at tip only (in the adult) where they are broadened and hollowed out.

Legs with meris subcylindrical and smooth, carpus and propus nearly smooth and sometimes very faintly grooved, dactylus granular and furred along both edges as far as the claw.

Abdomen of male five-jointed.

Colours in spirit: dirty yellow or dirty green, sometimes mottled; fingers black.

In the Indian Museum are more than 130 specimens, chiefly from the Andamans, Mergui, Karáchi, also from the Persian Gulf, Bombay, Ceylon, Akyab and Penang.

#### 45. *Xantho (Leptodius) sanguineus* (Edw.) A. M. Edw.

*Chlorodius sanguineus*, Milne Edwards, Hist. Nat. Crust. I. 402: Dana Proc. Ac. Nat. Sci. Philad. 1852, p. 79, and U. S. Expl. Exp. Crust. pt. I. p. 207, pl. xi. figs. 11a—d: Heller, Novara Crust. p. 18: Streets, Bull. U. S. Nat. Mus. VII. 1877. p. 105.

*Leptodius sanguineus*, A. Milne Edwards, *Nouv. Archiv. du Mus.* IV. 1868, p. 71, and IX. 1873, p. 224: Richters in Möbius, *Meeresf. Maurit.* p. 147: Haswell, *Cat. Austral. Crust.* p. 60: F. Muller, *Verh. Ges. Basel*, VIII. 1886, p. 474: de Man, *Zool. Jahrb., Syst.* VIII. 1894-95, p. 521: Whitelegge, *Mem. Austral. Mus.* III. 1897, p. 137.

*Leptodius exaratus*, var. *sanguineus*, Miers, *P. Z. S.* 1877, p. 134; *Ann. Mag. Nat. Hist.* (5) V. 1880, p. 234; Challenger *Brachyura*, p. 138: Cano, *Boll. Soc. Nat. Napoli*, III. 1889, p. 203.

*Lagostoma nodosa*, Randall, *Journ. Ac. Nat. Sci. Philad.* 1839, p. 111.

*Chlorodius nodosus*, Dana, *Proc. Ac. Nat. Sci. Philad.* 1852, p. 79, and *U. S. Expl. Exp. Crust.* pt. I. p. 210, pl. xi. figs. 14a-g.

*Chlorodius edwardsi*, Heller, *Abh. zool.-bot. Ges. Wien*, 1861, p. 10, and *SB. Ak. Wien XLIII.* 1861, i. p. 336: Hilgendorf in v. d. Decken's *Reis. Ost. Afr.* III, i. p. 74.

*Xantho exaratus* var. *sanguinea*, Ortmann, *Zool. Jahrb. Syst.* VII. 1893-94, p. 447.

Differs from *Xantho (Leptodius) exaratus* in the following particulars:—

(1) the carapace is more convex anteriorly, and the branchial lobules also are more convex:

(2) there are five teeth on the antero-lateral margin, not including the external orbital angle and a small denticle below it:

(3) the postero-lateral border is a good deal shorter than the chord of the antero-lateral border:

(4) the front is distinctly narrower.

In the Indian Museum are 123 specimens chiefly from the Andamans and Laccadives, also from the Nicobars, Ceylon, and Persian Gulf.

#### 46. *Xantho (Leptodius) crassimanus*, A. M. Edw.

*Xantho crassimanus*, A. Milne Edwards, *Ann. Soc. Ent. France* (4) VII. 1867 p. 267.

*Leptodius crassimanus*, A. Milne Edwards, *Nouv. Archiv. du Mus.* IX. 1873, p. 226, pl. xi. fig. 4: Haswell, *Cat. Austral. Crust.* p. 61: Muller, *Verh. Ges. Basel*, VIII. 1886, p. 474: de Man, *Archiv. für Naturges.* LIII. 1887, i. p. 287, and *Notes Leyden Mus.* XV. 1893, p. 284, and *Zool. Jahrb., Syst.* VIII. 1894-95, p. 522.

*Xantho exaratus* var. *crassimana*, Ortmann, *Zool. Jahrb. Syst.* VII. 1893-94, p. 448.

Differs from both *exaratus* and *sanguineus* in the following particulars:—

(1) the two lobes of the front have the free edge not merely emarginate, but deeply concave, so that the front appears to be formed of four little teeth:

(2) the carapace, anteriorly, is much more convex, the regions are more convex and their areolæ are more convex:

(3) the fingers are not so broad at tip and not so sharply hollowed out:

(4) the upper surface of the wrist and hand is more rugose. It resembles *sanguineus* in having 5 teeth on the antero-lateral margin, but differs from it further in having

(5) the front even narrower, it being less than one-fifth the breadth of the carapace.

It can at once be distinguished by the *very narrow* quadridentate front.

In the Indian Museum are 22 specimens, from the Andamans, Karáchi, Galle (and Australia).

#### 47. *Xantho (Leptodius) nudipes* (Dana), A. M. Edw.

*Chlorodius nudipes*, Dana, Proc. Ac. Nat. Sci. Philad. 1852, p. 79, and U. S. Expl. Exp. Crust. pt. I. p. 209, pl. xi. figs. 12a-c.

*Leptodius nudipes*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 225 : Miers, Cat. Crust. New Zealand, p. 17 : Filhol, Crust. New Zealand, p. 374 : de Man, Journ. Linn. Soc. Zool., XXII. 1887-88, p. 33, and Zool. Jahrb. Syst. 1894-95, p. 523.

*Xantho exaratus* var. *nudipes*, Ortmann, Zool. Jahrb. Syst. VII. 1893-94, p. 447.

The whole surface of the carapace is very finely pitted or granular. The antero-lateral border is divided into four acute lobes or teeth, but each of the first three teeth have, at base, either one or two (one on either side) small additional cusps, and the fourth tooth is generally double, so that altogether there are from 8 to 11 teeth on the antero-lateral margin. The fingers are broad and deeply hollowed at tip. The upper surface of hand and wrist is granular and rugose. The lobes of the front are deeply concave.

In the convexity of the carapace and of its regions and subregions it resembles *sanguineus*; but the front is much broader than in *sanguineus*, being more than one-fourth the breadth of the carapace, and the fingers are typical spoons.

In the Indian Museum are 17 specimens from the Andamans and 3 from Mergui.

#### 48. *Xantho (Leptodius) euglyptus*, n. sp.

Form of carapace much resembling that of *sanguineus*, but much more convex.

Carapace  $\frac{2}{3}$  as long as broad, rather strongly convex in its anterior two-thirds, flat posteriorly: its regions well delimited, convex, and as completely areolated as any *Actæa*—the areolæ being strongly convex and somewhat pitted transversely.

Front projecting beyond the orbit, from which it is separated by a notch, cut into two lobes of which the outer angle is prominent much as in *crassimanus*; its breadth is not quite a third that of the carapace.

Antero-lateral border cut into five conical teeth between which are granules or little denticles; postero-lateral borders strongly convergent, shorter than chords of antero-lateral borders.

Chelipeds unequal: upper and outer surfaces of wrist strongly wrinkled and pitted; upper surface of hand nodular, upper half or more of outer surface of hand longitudinally ridged and transversely wrinkled: fingers short, stout, hollowed (but not broadened) at tip.

Legs with carpus and propodite longitudinally ridged and grooved above—the carpus more distinctly so—and dactylus furred.

Sidewall of carapace, edges of upper surface of arm, and edges of legs—but especially upper edge of meropodites—hairy.

Colours in spirit: yellow, fingers and front lower corner of hand blackish brown.

Length of carapace 10.5 millim., breadth 16 millim.

In the Indian Museum are 45 specimens from Galle and 1 from Mergui (Marine Survey).

This species, though strongly resembling *nudipes* and *crassimanus*, is at once recognized by the sharp-cut Actæa-like sculpture of the carapace. It is possible that it may be the *Chlorodius eudorus* of Milne Edwards. It has the closest possible resemblance to the *Xantho quinquedentatus* of Krauss, Sudafr. Crust. p. 30, pl. i. fig. 3, but that species is described and figured as having sharp fingers.

#### 49. *Xantho (Leptodius) cavipes* (Dana).

*Chlorodius cavipes*, Dana, Proc. Ac. Nat. Sci. Phila., 1852, p. 79; and U. S. Expl. Exp. Crust. pt. I. p. 212, pl. xii. figs. 1a-b: Stimpson, Proc. Ac. Nat. Sci. Phila., 1858, p. 34.

*Leptodius cavipes*, de Man, Journ. Liun. Soc., Zool., XXII. 1887-88, p. 34.

Carapace convex in anterior two-thirds, flat behind. Gastric region convex, well delimited and areolated by fine smooth rather deep channels; wings of carapace divided into about five lobules by less deep-cut and less smooth channels: the whole carapace (except the channels) covered with miliary granules, which on the lateral lobes of the gastric region are arranged in lines that have an imbricate look.

Front bilaminar, the fore edge of the lobes thickened and granular. Antero-lateral border thickened and granular, cut into small irregular teeth—8 or 9 in number—which fall into 4 sets. Undersurface of carapace with short fur.

Chelipeds unequal: upper and outer surface of wrist and hand wrinkled and granular, outer surface of hand covered with granules in more or less distinct lines: fingers little toothed, incurved, blunt-pointed and hollowed (but not broadened) at tip.

Legs rough, but not very hairy : upper edge of meropodites finely serrated, distally sharply notched : *upper surface of carpopodites with two high longitudinal crests enclosing a trough-like space*; the propodites are similarly sculptured, but the sculpture is a good deal concealed by fur : dactyli furred.

Colours in spirit: dirty yellow or dirty greenish, fingers nearly black in distal  $\frac{3}{4}$  only.

In the Indian Museum are 4 specimens, from the Andamans, Mergui and Ceylon.

#### MEDÆUS, Dana.

*Medæus*, Dana, Silliman's Amer. Journ. Sci. and Arts, (2) XII. 1851, p. 125; Proc. Ac. Nat. Sci. Philad. 1852, p. 76; U. S. Expl. Exp. Crust. pt. I. p. 181.

*Medæus*, A. Milne Edwards, Ann. Sci. Nat. Zool. (4) XX. 1863, p. 279; Miss. Sci. Mex. Crust. p. 249.

*Medæus*, Miers, Challenger Brachyura, p. 116.

Carapace not very broad, hexagonal, little convex, the regions well defined and well areolated.

Antero-lateral borders cut into teeth and *very distinctly continued beneath the orbits to the angles of the buccal cavern.*

Fronto-orbital border half, or a little more than half, the greatest breadth of the carapace.

Front about a fourth, or a little more, the greatest breadth of the carapace, horizontal, rather prominent, square-cut, notched in the middle line, separated from the supra-orbital margin by a notch.

Orbits, eyes, basal antennal joint and antennary flagellum as in *Xantho*.

Chelipeds either unequal or subequal, the wrists and hands commonly covered with large nodules, the fingers pointed.

The abdomen of the male consists of five pieces, the 3rd-5th somites being fused.

*Medæus* closely resembles *Xantho*, but is distinguished by the narrower carapace and by the relations of the antero-lateral border. In some species of *Xantho* (e.g., *X. distinguendus*) the antero-lateral border is broken and eroded near the orbit, so that it may be imagined to be continued to the angle of the buccal cavern, but in *Medæus* there is no ambiguity whatever.

#### 50. *Medæus nodosus*, A. M. Edw.

*Medæus nodosus*, A. Milne Edwards, Ann. Soc. Ent. France, (4) VII. 1867, p. 271; Nouv. Archiv. du Mus. IX. 1873, p. 212, pl. viii. fig. 2; Haswell, Cat. Austral. Crust. p. 52.

Carapace shaped much as in *Polycremnus*, hexagonal, more than  $\frac{3}{4}$

as long as broad, the regions well demarcated, well areolated, finely and closely granular.

Front horizontal, square-cut, prominent, sublaminar, notched and grooved in the middle line.

Antero-lateral borders cut into four blunt-pointed rather coarse granular teeth, of which the two posterior are the strongest.

Chelipeds subequal: wrist and hand covered with granular fungi-form tubercles, which are arranged in regular longitudinal series on the hand.

Upper border of meropodites of legs without spinules.

In the Indian Museum is a single small male from off the Ganjam coast,  $7\frac{1}{2}$ - $9\frac{1}{2}$  fms.

Henderson (Trans. Linn. Soc. (2) V. 1893, p. 360) appears to consider this species to belong to the genus *Halimede*, but it has not—if my identification be correct—the curious male abdomen which distinguishes that genus from every other Xanthoid except *Polycremnus*.

#### CYCLOXANTHUS, A. Milne Edwards.

*Cycloxanthus*, A. Milne Edwards, Ann. Sci. Nat., Zool. (4) XX. 1863, p. 278; Nouv. Archiv. du Mus. IX. 1873, p. 209; Miss. Sci. Mex., Crust. p. 258.

Carapace relatively long: front horizontal, prominent, and divided by a median fissure into two lamellar lobes, and separated from the internal orbital angles by a deepish notch.

Orbits small: two fissures in the supra-orbital margin: external orbital angles inconspicuous, continuous with the antero-lateral borders.

Antero-lateral borders very long, strongly curved, extending far backwards.

Basal antennal joint short, but touching the front at its inner angle: the flagellum inserted in the orbital hiatus.

Merus of the external maxillipeds subquadrilateral.

The abdomen of the male consists of five movable pieces.

This genus is not represented in the Indian Museum.

#### 51. *Cycloxanthus lineatus*, A. Milne Edwards.

*Cycloxanthus lineatus*, A. Milne Edwards, Ann. Soc. Entom. France, (4) VII. 1867, p. 269, and Nouv. Archiv. du Mus. IX. 1873, p. 209, pl. vi. fig. 5: Miers, Zool. H. M. S. Alert, pp. 183, 212: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 360.

Carapace broad, very depressed, smooth; the regions little defined; antero-lateral borders prolonged far backwards and obscurely divided into four dentiform lobes.



Outer orbital angle inconspicuous, orbits small, the upper margin with a narrow cleft.

Front very prominent, lamellar, a little sinuous at the sides, prominent towards the middle where there is a linear fissure.

Chelipeds unequal: the hand has the inner surface flattened, the upper border obtusely crested, and the outer surface rugose: the wrist, which has its outer border much dilated, is equally rugose.

The legs are weak and smooth, the dactylus being a little compressed.

Carapace yellowish, very symmetrically marked with numerous reddish-brown lines, some of which run obliquely from the antero-lateral borders towards the front and towards the middle line, while others run from the posterior border forwards to the cardiac region.

There are no specimens in the Indian Museum collection.

#### HOPLOXANTHUS, n. gen.

Carapace hexagonal, moderately broad, moderately convex fore and aft, its regions all well defined, and to a certain extent subdivided.

The antero-lateral borders are thin and crest-like and are on a much lower plane than the rest of the carapace, they end either in both sexes or in the female only, in a large horizontal lateral epibranchial spine, and may either be cut into large triangular teeth or may be only obscurely notched.

Postero-lateral borders straight, moderately convergent, about as long as the antero-lateral.

Front lamellar, prominent, horizontal, notched in the middle line, about a fourth to two-sevenths the greatest breadth of the carapace.

Orbital margin with two faintish notches or suture lines above, and with a small triangular gap just below the outer angle: the inner angle of the lower orbital margin forms a strongly-projecting tooth: the outer orbital angle is confluent with the antero-lateral margin.

The antennules fold obliquely. The basal antennal joint is rather slender and meets the front: the flagellum, which is about as long as the major diameter of the orbit, is lodged in the orbital hiatus.

The anterior edge of the external maxillipeds is almost transverse.

Chelipeds unequal, fingers sharp pointed: legs rather slender.

No ridges, defining the efferent branchial channels, on the plate.

The abdomen of the male consists of seven separate segments, the last segment being no longer than the longest of the others.

This genus is closely allied to *Xantho* and *Cycloxanthus*, it is also related not distantly to *Halimede* and to *Lophozozymus*.

52. *Hoploxanthus hextii*, n. sp.

The whole of the carapace, legs, and outer surface of chelipeds is covered with a dense, darkish, extremely short, velvety or branny pubescence.

Carapace hexagonal, moderately broad, moderately convex, the regions well defined, tumid, their convexities granular.

Front prominent beyond the orbits and separated from them by a notch, square-cut, bilaminar.

Antero-lateral border thin sharp, cut into four triangular lacinate teeth, the last of which—in the female but not in the male—is an acute salient spine.

The edges of all the teeth, of the front, and of the orbit are finely granular.

The postero-lateral border is elegantly granular and quite straight: dorsal to it the wall of the carapace forms a distinct postero-lateral facet, sharply marked off from the general surface of the carapace.

Chelipeds a little unequal in both sexes: wrist with a small somewhat cristiform expansion at the outer angle and a tooth at the inner angle: upper surface of hand with two or three longitudinal raised sculptured lines, the innermost of which consists of a blunt cristiform lobule followed by one or two blunt denticles, the outer one or two being simply crenulate and granular; the outer surface of the smaller hand is everywhere granular, that of the larger hand is granular in part—in both cases some of the granules form slightly-raised longitudinal lines.

Legs long, slender.

Colours in spirit yellowish brown.

Carapace of male 10 millim. long, 13 millim. broad; of female, 11 millim. long, 17 millim. broad.

In the Indian Museum are 3 specimens from the east coast of India and 2 from the Nicobars.

53. *Hoploxanthus cultripes*, n. sp.

Carapace hexagonal: the three gastric subregions (lateral and post-medial), the cardiac region, and two (smaller) median epibranchial regions stand out as very prominent granular bosses, and the convexity of the lateral epibranchial spine, and the postero-lateral border and its neighbourhood are granular,—otherwise the carapace is quite smooth.

Front prominent, sublaminar, with a curved convex finely granular edge, faintly notched in the middle line and hardly separated from the supra-orbital angles.

Antero-lateral borders very thin and sharp, obscurely divided by faint notches and fainter grooves into 3 broad inconspicuous lobes, and ending in a strong horizontal pyramidal lateral epibranchial spine.

The chelipeds in the unique specimen are lost; but the legs are remarkable in having the upper edge of the merus and carpus sharply carinate, the carpal joints having a second blunter and lower keel along the dorsal surface.

The legs and the undersurface of the body are covered with the same dense extremely short pubescence as occurs in *H. heatii*.

The single imperfect male in the Indian Museum comes from Karáchi, and is 9 millim. long and 13 millim. broad.

#### ORPHNOXANTHUS, n. gen.

Carapace, owing to the inflation of the branchial regions almost quadrilateral in outline and almost concave from side to side, but very decidedly convex fore and aft, broad, the regions well defined but not to any great extent areolated.

Fronto-orbital border a little more than half the greatest breadth of the carapace in extent. Front about a third the greatest width of the carapace, lamellar, projecting horizontally beyond the orbits, broadly and faintly bilobed. Orbital margin entire: orbits and eyes small.

Antero-lateral border cut into four teeth; postero-lateral borders convergent only in the posterior half; posterior border long.

The antennules fold almost transversely. The basal antennal joint is very short and only just touches the turned down edge of the front; the flagellum which is very long (between 2 and 3 times the length of the orbit) is lodged in the narrow orbital hiatus.

Owing to the bulge of the outer wall of the efferent branchial canal and the consequent puffing out of the pterygostomial regions, the front edge of the merus of the external maxillipeds is quite transverse or even slightly oblique from without inwards.

The chelipeds are massive and unequal; the fingers are compressed and pointed. The legs are very slender.

The abdomen of the male consists of 5 segments, the 3rd-5th somites being fused.

Owing to the inflation of the pterygostomial regions the efferent branchial channels are permanently open, but the low crests that define them are confined to the posterior part of the endostome.

This genus appears to represent one of the links between *Galene* and *Xantho*. The single known species comes from the Bay of Bengal, 105-350 fms.

54. *Orphnozanthus microps*, Alcock and Anderson.

*Xanthodes microps*, Alcock and Anderson, J. A. S. B. LXIII. pt. 2, 1894, p. 183.

Carapace about  $\frac{2}{3}$  as long as broad, almost quadrilateral in outline, strongly convex fore and aft, but, owing to the inflation of the branchial regions, a little *concave* from side to side; it is rather closely covered with a very fine short fur, beneath which the surface may be granular or nearly smooth, but the margins are always granular. The regions are all well defined and are slightly tumid: the gastric region is divided into 3 gently tumid subregions, the branchio-hepatic regions are subdivided transversely into three areas, and the fronto-orbital margin is also marked off.

The antero-lateral border is thin and sharp and is cut into four sharp finely granular teeth, the first of which runs by a long nearly transverse margin, into the (undefined) angle of the orbit. The front is laminar and projects beyond the supra-orbital margin; it is square-cut and is slightly notched in the middle line, so as to form two broad shallow lobes. The eyes are small and are to a variable extent deficient in pigment.

The chelipeds are unequal—very much more so in the male than in the female: the arm to a variable extent, the entire surface of the wrist, and the upper border of the hand are scabrous and more or less hairy; the other surfaces of the hand may be smooth and polished, or the outer surface may be to a variable extent granular: the fingers are large, compressed and pointed.

In the male the larger cheliped is about  $2\frac{1}{2}$  times the length of the carapace (the hand and fingers forming slightly more than half the length) and nearly half the arm projects beyond the carapace in repose.

The legs are long slender and finely and sparsely hairy: the upper edge of the meropodites is scabrous or closely spinulate.

Colours in spirit; chestnut brown with blackish fingers. Length of carapace (average) 11 millim., breadth 15 to 16 millim.

In the Indian Museum are 29 specimens from the Bay of Bengal, 105–350 fms.

## ETISUS, Milne Edwards.

*Etisus*, Milne Edwards, Hist. Nat. Crust. I. 410.

*Etisus*, Dana, Silliman's Amer. Journ. Sci. and Art. (2) XII. 1851, p. 126; and U. S. Expl. Exp. Crust. pt. I. p. 183.

*Etisus*, A. Milne Edwards, Ann. Sci. Nat., Zool., (4) XX. 1863, p. 291; and Nouv. Archiv. du Mus. IX. 1873, p. 233.

*Etisus*, Miers, Challenger Brachyura, p. 131.

Carapace broad, moderately convex in both directions, with the

regions delimited by broad shallow rather indistinct depressions and having a slightly uneven but not definitely lobulated surface.

The front is laminar and narrow; it projects well beyond the supra-orbital border from which it is separated by a deep notch, and is split by a suture in the middle line. The orbital margin is broken by three sutures or actual fissures, and the tooth at the inner angle of the lower border is very prominent.

The antero-lateral borders, which are a good deal longer than the postero-lateral, are cut into from 4 to 8 lobes or procurved spines.

The basal antennal joint has its outer angle produced and tightly wedged into the internal orbital gap, which it fills; but the flagellum, which is of good length, does not arise within the orbit but at the base of this process.

The outer border of the merus of the external maxillipeds is oblique.

The chelipeds, which are very massive and rather long, are a little unequal in the male: the fingers are very stout and strongly arched, and they meet only at the tip, which is broad expanded and hollowed out almost like a horse's hoof.

The abdomen of the male is five-jointed, the 3rd-5th somites being fused.

*Key to the Indian species of Etisus.*

- I. More than four teeth on the antero-lateral border, excluding the external angle of the orbit: free edge of front not convex: the process of the basal antennal joint completely separates the lower from the upper inner angle of the orbit: legs spiny:—
- i. Seven or eight uneven unequal-sized claw-like teeth on the antero-lateral border ..... *E. dentatus.*
  - ii. Seven evenly arranged broad compressed procurved teeth of almost uniform size on the antero-lateral margin ..... *E. utilis.*
- II. Four teeth (excluding the external angle of the orbit) on the antero-lateral border: free edge of front bow-shaped: the tooth at the inner canthus of the orbit in contact with the eave of the orbit beyond the tip of the process of the basal antennal joint: legs not spiny ..... *E. lævimanus.*

55. *Etisus dentatus*, (Herbst) Edw.

*Cancer dentatus*, Herbst, Krabben, I. ii. 186, pl. xi. fig. 66.

*Etisus dentatus*, Milne Edwards, Hist. Nat. Crust. I. 411: Dana, U. S. Expl.

Exp. Crust. pt. I. 185, pl. x. figs. 2a-b: A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 233: Miers, P. Z. S. 1877, p. 134: Richters in Möbius, Meeresf. Maurit.

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p. 146 : Lenz and Richters, *Abh. Senck. Ges. XII. 1881*, p. 421 : Haswell, *Cat. Austral. Crust.* p. 53.

*Etisodes dentatus*, Ortmann, *Zool. Jahrb. Syst. VII. 1893-94*, p. 472.

Carapace smooth (non-granular) : gastric region well defined except at cardiac end, its surface broken, but not definitely lobulated ; similarly with the branchio-hepatic regions.

The antero-lateral border bears 7 or 8 (exclusive of the external orbital angle) pro-curved claw-like teeth, uneven both as to size and place, though four of them—which correspond to the 4 lobes of so many other Cancroids—are much of one size and much larger than the other 3 or 4.

The front is lamellar with the free edge slightly and angularly emarginate, and is cleft in the middle line by a fine sharp groove that extends well on to the gastric region. The orbital margin has three teeth, separated by fissures, in its outer part. The tooth at the inner angle of the lower edge of the orbit is sharp, and does not come into contact with the eave of the orbit.

Chelipeds in the adult male a little more, in the adult female a little less than twice the length of the carapace : the arm has a few spinules and a good deal of hair along the upper border, and some granules or blunt spicules along its lower and its distal borders ; the wrist has a strong spike at its inner angle ; the hand may or may not have a few pimple-like granules on its upper outer surface ; and the fingers are fluted, the ridges on the dactylus being crenulate or dentate. Otherwise the chelipeds are smooth.

In the legs, the merus has both the dorsal and the ventral edges thickly fringed with long stiff hairs, the dorsal edge being also granular ; the carpus has at least three series of spinules along its dorsal surface ; the propodite has a rather granular surface with about four (dorsal) series of spinules, and has much of its lower edge fringed with long stiff hairs ; and the dactylus is spiny above and hairy below.

Colours of a specimen 7 years in spirit : upper surface bright maroon fading to yellow near the posterior border ; fingers black.

In the Indian Museum are a young female from Port Blair (Andamans), and three large males (carapace 72 millim. by 111 millim.) from Great Coco I. (Andamans) and East I. Andamans.

#### 56. *Etisus utilis*, Lucas.

*Etisus utilis*, Lucas in Jacquinot, *Voy. Astrolabe, Crust.* p. 27, pl. ii. fig. 6 : Heller, *Novara Crust.* p. 16 : A. Milne Edwards, *Nouv. Archiv. du Mus.* IX. 1873, p. 233 : E. Nauck, *Zeits. Wiss. Zool.* XXXIV. 1880, p. 58 (gastric teeth) : Lenz and Richters, *Abh. Senck. Ges. XII. 1881*, p. 421 : Ortmann, *Zool. Jahrb. Syst. VII. 1893-94*, p. 472.

Carapace smooth (non-granular), distantly pitted in the anterior and lateral parts. Gastric region fairly well defined, except at the cardiac end, its surface showing indistinct traces of lobulation: branchio-hepatic regions with the surface a little uneven.

Antero-lateral border with 7 (exclusive of the external orbital angle) regular, even, nearly uniform, compressed, procurved teeth.

Front as in *Etisus dentatus*, but with the angles a little sharper cut. The edge of the orbit is trenchant, and near the outer angle are 3 not very distinct suture-lines: the tooth at the inner angle of the lower border of the orbit is prominent, and does not come into contact with the eave of the orbit.

Chelipeds in the adult male twice to twice-and-a-half, in the adult female once-and-a-half to once-and-two-thirds the length of the carapace: upper and lower edges of arm coarsely and unevenly granular, much of the upper edge also hairy; distal end of wrist with 4 or 5 teeth, the inner two of which are long and large; the hand has, along its upper border, a double crest of strong teeth, continued in blunter form along the finger, and on the outer surface of the hand there may be a few pimple-like granules.

In the legs, both the upper and lower edges—but most the upper edge—of the merus, carpus and propodite are thickly fringed with long bristles, as also is the lower edge of the dactylus; the upper edge of the merus has also a row of small spines, and the upper edge of the carpus, propus and dactylus a double row of increasingly larger spines: the lower edge also of the propus and dactylus is spiny.

Colours in spirit: dull yellowish pink, fingers black.

In the Indian Museum are a male and a female from the Singapore Museum, and supposed to have come from Singapore. (Heller *l.c.* records this species from the Nicobars).

#### 57. *Etisus laevimanus*, Randall.

*Etisus laevimanus*, Randall, Journ. Acad. Nat. Sci. Philad. 1839, p. 115: Dana, Proc. Ac. Nat. Sci. Phila. 1852, p. 76, and U. S. Expl. Exp. Crust. pt. I. p. 185, pl. x, figs. 1a-b: A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 234: Kossmann, Reise roth Meer. Crust. p. 30: T. Tozzetti, Magenta Crust. p. 29: Streets, Bull. U. S. Nat. Mus. VII. 1877, p. 105: Hilgendorf, MB. Ak. Berl. 1878, p. 791: Richters in Möbius Meeresf. Maurit. p. 146: de Man, Notes Leyden Mus. III. 1881, p. 99; and Archiv. für Naturges. LIII. 1887, i. p. 289; and Zool. Jahrb. Syst. VIII. 1894-95, p. 527: Haswell, Cat. Austral. Crust. p. 54: Miers, Zool. H. M. S. Alert, pp. 183, 217; and Challenger Brachyura, p. 132: F. Muller, Verh. Ges. Basel VIII. 1886, p. 474: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 362: Ortmann, Zool. Jahrb. Syst. VII. 1893-94, p. 473: Whitelegge, Mem. Austral. Mus. III, 1897, p. 131.

*Etisus macrodactylus*, Lucas in Jacquinot's Voy. Astrolabe, Crust. p. 30, pl. ix. fig. 2, (A. M. E.)

*Etisus convexus*, Stimpson, Proc. Ac. Nat. Sci. Phila. 1858, p. 31.

*Etisus maculatus*, Heller, Abh. zool.-bot. Ges. Wien XI. 1861, p. 9; and SB. Ak. Wien, XLIII. 1861, p. 332: de Man, Notes Leyden Mus. II. 1880, p. 173.

Gastric region well defined on all sides, its anterior part distinctly lobulated; branchio-hepatic regions with three lobules following the curve of the antero-lateral margins.

Antero-lateral border with 4 broad teeth (exclusive of the external orbital angle), the last two of which culminate in procurved points.

The front is cleft in the middle line by a groove; its free edge is bow-shaped. The orbital margin has, in its outer half, three lobular constrictions defined by three grooves.

The tooth at the inner angle of the lower edge of the orbit is blunt, and it comes into contact with the eave of the orbit beyond the tip of the process of the basal joint of the antenna.

Chelipeds in the adult male about twice and a half, in the adult female a little less than twice the length of the carapace; the wrist has a blunt spine at the inner angle, otherwise they are smooth and unsculptured.

Legs with both edges of all the long joints hairy, most so on the lower edge of the dactylus and on the upper edge of the other joints: the upper edge of the propodite and dactylus is also sharply granular, but there are no spines.

Colours in spirit variable: dull yellow, or dull greenish-brown, or sea-green, often with cinnamon coloured patches or small spots.

In the Indian Museum are 20 specimens, from Persian Gulf, Karáchi, Bombay, Laccadives, Andamans, and Singapore, (besides specimens from Celebes and Mauritius).

#### ETISODES, Dana.

*Etisodes*, Dana, Silliman's Amer. Journ. Sci. and Arts, (2) XII. 1851, p. 126 (footnote); Proc. Ac. Nat. Sci. Phila. 1852, p. 77; and U. S. Expl. Exp. Crust. pt. I. p. 184.

*Etisodes*, A. Milne Edwards, Ann. Sci. Nat., Zool., (4) XX. 1861, p. 291; and Nouv. Archiv. du Mus. IX. 1873, p. 235.

The genus *Etisodes* resembles *Etisus* in the characteristic form and lie of the basal joint of the antennæ, and in the characteristic relation of the front to the orbits; but it differs in the following particulars:—

The carapace is much longer and narrower; it is less convex, especially in its posterior third; its regions are clearly defined, and are definitely sculptured into lobules in the anterior two-thirds of the carapace: the



chelipeds are much shorter, the difference in length being chiefly in the arm; and the fingers though well hollowed out at tip are not so hoof-like.

### 58. *Etisodes anaglyptus*, (Edw.)

*Cancer anaglyptus*, Milne Edwards in Cuvier, Règne An. Crust. pl. xi. fig. 4.

*Etisus anaglyptus*, Milne Edwards, Hist. Nat. Crust. I. 411: Hess, Archiv. für Naturges. XXXI. 1865, i. p. 134: de Man, Notes Leyden Mus. XIII. 1891, p. 7.

*Etisodes anaglyptus*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 235: Haswell, Cat. Austral. Crust. p. 55: Miers, Zool. H. M. S. Alert, pp. 183, 218: Ortman, Zool. Jahrb. VII. 1893-94, p. 471.

Length of carapace nearly three-quarters the breadth.

The regions are all convex and well defined, and the gastric and branchio-hepatic regions are subdivided into convex lobules, the surface of which is somewhat dented transversely.

The antero-lateral border is cut into four (excluding the external angle of the orbit) procurved teeth, the last two of which are claw-like.

The front projects strongly, and is divided into two dorsally-convex lobes, of which the free edge may either be cut obliquely inwards, or be so excised as to give the front a four-pronged look.

The orbital margin has, in its outer half, three grooves separating three blunt teeth: the tooth at the lower inner angle does not come in contact with the eave of the orbit.

Chelipeds in the male not much more than half again as long as the carapace: upper and anterior borders of arm hairy; upper surface of wrist nodular, with two teeth (one large) at the inner angle; upper outer surface of hand with rather irregular longitudinal series of little nodules and granules; dactylus fluted, the ridges being crenulated.

Legs very shaggy, the hairs almost concealing some lines of sharp granules or spinules on the propodite and dactylus.

In the Indian Museum is a specimen from the Persian Gulf (besides one from Samoa).

### 59. *Etisodes electra* (Herbst), Miers.

*Cancer electra* and ? *metis*, Herbst, Krabben, III. ii. 34 and 36, pl. li. fig. 6, and pl. liv. fig. 3.

*Etisus rugosus*, Lucas in Jacquinot's Voy. Astrolabe III. Crust. p. 33, pl. iv. fig. 2 (vide A. M. E., *infra*).

? *Chlorodius dentifrons*, Stimpson, Proc. Ac. Nat. Sci. Phila. 1858, p. 34.

*Etisodes sculptilis*, Heller, Abh. zool.-bot. Ges. Wien XI. 1861, p. 10, and SB. Ak. Wien XLIII. 1861, p. 333: A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 236, pl. ix. fig. 2: Kossmann Reise roth. Meer., Crust. p. 30.

*Chlorodius samoensis*, Miers, Ann. Mag. Nat. Hist. (4) XVI. 1875, p. 341 (Miers *infra*.)

*Etisodes electra*, Miers, Zool. H. M. S. Alert, pp. 183, 217, 517, 532: de Man, Archiv. für Naturges. LIII. 1887, i. p. 290: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 362.

Closely resembles *E. anaglyptus*, from which it is distinguished by the following characters:—

(1) the carapace is even longer and narrower, the length being quite  $\frac{3}{4}$  the breadth;

(2) the whole surface of the lobules of the carapace and of the nodules of the wrist and hand is closely granular;

(3) the front is cut into four teeth of nearly equal size;

(4) the legs, though hairy, are not so shaggy.

In the Indian Museum are 4 specimens from the Andamans and Nicobars, (besides three from Upolu and Mauritius).

#### Alliance V. *Halimedoida*.

Halimede.

Polycremnus.

#### POLYCREMNUS, Gerstaecker.

*Polycremnus*, Gerstaecker, Archiv. für Naturges. XXII. 1856, p. 120.

Carapace approaching the pentagonal, not very much broader than long, distinctly convex fore-and-aft, slightly convex from side to side, the regions rather indistinctly defined and to a certain extent subdivided by broad shallow depressions.

The antero-lateral border is elegantly four-lobed and is continued beneath the orbits to the outer angle of the buccal cavern. The postero-lateral borders are moderately convergent and are about equal in length to the antero-lateral borders and also to the posterior border.

The fronto-orbital border is less than half the greatest width of the carapace in extent. The front is narrow (less than a fourth the greatest breadth of the carapace), sublaminar or hood-like, bilobed, and projects well beyond the orbits. The three grooves in the vicinity of the outer angle of the orbit are distinct. Eyes on short thick stalks. The inner angle of the lower edge of the orbit is strongly produced.

The antennules fold obliquely. The basal antennal joint is long, rather slender, and well in contact with the front: the flagellum is long (a good deal longer than the major diameter of the orbit) and is lodged in the narrow orbital hiatus.

Anterior edge of merus of external maxillipeds almost transverse.

Chelipeds unequal in both sexes. Legs stout.

Abdomen of the male with all 7 joints distinct and separate: the last segment unusually long and acute.

60. *Polycremnus ochtodes*, (Herbst) Gerstaecker.

*Cancer ochtodes*, Herbst, Krabben, I. ii. 158, pl. viii. fig. 54: Fabricius, Ent. Syst. II. 455, and Suppl. p. 337.

*Galene ochtodes*, Adams and White, Samarang Crust. p. 43, pl. x. fig. 2.

*Polycremnus ochtodes*, Gerstaecker, Archiv. fur Naturges. XXII. 1856, p. 121: A. O. Walker, Journ. Linn. Soc., Zool., XX. 1886-90, p. 110: Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 359.

Carapace oval-pentagonal, its surface smooth, a little lumpy owing to the broad shallow depressions that somewhat indistinctly separate and to a certain extent subdivide the regions.

All the borders are of about equal length: the antero-lateral is divided into four rounded deep-cut lobes, decreasing in size from behind forwards, and is continued beneath the slightly tumid lobe of the orbital angle to the angle of the buccal cavern: on the postero-lateral border just behind the junction with the antero-lateral are usually a few granules.

The front projects horizontally forward beyond the orbits and consists of two unguiform lobes separated in all their extent by a deep narrow groove: it is a distinct rostrum.

The chelipeds are unequal, most markedly so in the male. The upper border of the arm is elegantly cut into teeth or pisiform or pearl-like tubercles: two similar tubercles stand, one below the other, at the inner angle of the wrist, and the upper and outer surfaces of the wrist are more or less covered with papule-like or pustulous tubercles: the upper border of the hand, and of the basal half of the finger bears a row of pisiform tubercles, and there are numerous pustulous tubercles on the upper surface and on the proximal part of the outer surface of the hand: fingers sharp pointed.

The legs are smooth, but the upper border of the meropodites of all, or of the first three pairs, is distantly serrate or spinulous: the dactylus and the neighbouring part of the lower border of the propodite is furred.

Colours in spirit leaden grey, or yellowish with livid markings.

In the Indian Museum are 2 specimens from the Madras Coast and one from Penang.

## HALIMEDE, De Haan.

*Halimede*, De Haan, Faun. Japon. Crust. p. 35: Dana, Amer. Journ. Sci. and Arts, (2) XII. 1851, p. 125, and U. S. Expl. Exp. Crust. pt. I. p. 149.

Closely allied to *Polycremnus*, having the same form of male abdomen.

The genus is not represented in the Indian Museum.

61. *Halimede* (?) *thurstoni*, Henderson.

*Halimede thurstoni*, Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 360, pl. xxxvi. figs. 13, 14.

It appears to me doubtful whether this is a true *Halimede*.

Alliance VI. *Galenoidea*. [OR Subfamily GALENINÆ].

## GALENE, De Haan.

*Galene*, De Haan, Faun. Japon. Crust. p. 19.

*Galene*, Miers, Challenger Brachyura, p. 118 (footnote.)

Carapace approaching the quadrilateral, strongly convex fore and aft, little convex from side to side; its surface granular in parts, or nearly smooth, and with the regions more or less distinctly shown by broad shallow rather vague depressions.

Antero-lateral border moderately arched, indistinctly four-lobed—the last 2 or 3 lobes in the typical species being marked by spine-like teeth: postero-lateral borders very slightly convergent, rather longer than the chord of the antero-lateral: posterior border long.

Fronto-orbital border less than half the greatest width of the carapace. Front obliquely deflexed, less than one-fifth the greatest width of the carapace in extent, bilobed or quadridentate. Orbital margin with the three grooves in the vicinity of the outer angle distinct: eyes on thick stalks of moderate length. The antennules fold nearly transversely.

Basal antennal joint broad, extremely short, not nearly reaching the front; flagellum longish (longer than the major diameter of the orbit) lodged in the broad orbital hiatus.

Anterior edge of merus of external maxillipeds a little oblique. Chelipeds massive, unequal in both sexes, fingers pointed. Legs long, stoutish.

Abdomen of male with all 7 joints separate and distinct.

No crests, delimiting efferent branchial canals, on the endostome.

62. *Galene bispinosa* (Herbst) De Haan.

*Cancer bispinosus*, Herbst, Krabben, I. ii. 144, pl. vi. fig. 45, and III. ii. 11, pl. liv. fig. 1: Fabricius, Ent. Syst. II. 446, and Suppl. p. 337.

*Cancer* (*Galene*) *bispinosus*, De Haan, Faun. Japon. Crust. p. 49, pl. v. fig. 2.

*Galene bispinosa*, A. O. Walker, Journ. Linn. Soc., Zool., XX. 1886-90, p. 110.

Carapace moderately broad, somewhat pentagonal, its surface for the greater part smooth, but usually scabrous near the borders—especially the postero-lateral borders; its surface is also somewhat lumpy,

owing to the very broad depressions which somewhat vaguely delimit and to a certain extent subdivide the regions. Pterygostomian region more or less hairy.

The antero-lateral borders are very indistinctly 4-lobed, the first lobe being almost obsolete, the second being usually marked by a granular denticle, and the third and fourth by two coarse granular spines. The postero-lateral borders, which are little convergent, are slightly longer than the chord of the antero-lateral. The posterior border is about half the greatest width of the carapace.

Front really bilobed, but with both the inner and the outer angles of each lobe so equally prominent as to appear 4-dentate.

Chelipeds unequal: exposed surfaces of arm either smooth, or more or less scabrous, both borders of arm uneven and hairy, the distal end of the upper border with two strong teeth: both the inner and the outer angles of the wrist well pronounced, or even spiniform; the exposed surfaces of the wrist may be almost smooth, but are usually studded, to a variable extent, with sharp little tubercles; the upper outer and lower surfaces of the hand may be almost smooth, but are usually studded, in the proximal third to three-quarters, with similar tubercles, in more or less distinct lines: fingers long, sharp-pointed, the apposed edges with strong molariform teeth.

Legs long, stoutish; upper border of the meropodites scabrous and spinulate, upper border of last 3 joints, and lower border of last 2, plumose.

Colours in spirit, leaden white or yellowish.

In the Indian Museum are 3 specimens from the Vizagapatam coast and 1 from Tennasserim, (besides one from Hongkong): the amount of granulation of the borders of the carapace and of the chelipeds is different in all.

### Subfamily II. ACTÆINÆ.

#### ACTÆA, De Haan, A. Milne Edwards.

*Actæa*, De Haan, Faun. Jap. Crust. p. 18.

*Actæa* and *Actæodes*, Dana, U. S. Expl. Exp. Crust. pt. I. pp. 162, 194.

*Actæa*, Heller, Crust. Sudl. Europ. p. 69.

*Actæa*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, pp. 259, 260.

*Psaumis*, Kossmann, Crust. roth. Meer. p. 26.

*Actæa* and *Actæodes*, Miers, Challenger Brachyura, pp. 118, 135.

Carapace convex fore and aft, slightly convex or flat from side to side, usually broad, the regions well demarcated by deep grooves, and again subdivided into lobules, which are usually convex and granular. Antero-lateral borders usually four-lobed, but the lobes are shallow and often indistinct. Postero-lateral borders usually concave, always short, not strongly convergent.

Front between a third and a fourth the greatest width of the carapace, deflexed, cleft in the middle line into two lobes. Upper edge of orbit tumid, usually with two fissures or sutures; a third below the outer orbital angle: eyestalks short and thick.

Antennules folding obliquely or nearly transversely. Basal antennal joint usually stopping at the angle of the deflexed front, but often prolonged beyond this, towards or nearly into the orbit; the flagellum is about as long as the orbit, and is lodged in the orbital hiatus.

Merus of the external maxillipeds with the anterior border little oblique.

Chelipeds equal in both sexes; fingers usually blunt-pointed, sometimes hollowed-out at tip.

Abdomen of the male five-jointed, somites 3, 4, 5 fused.

Small crabs, distinguished by the elaborate lobulation of the carapace, and by the form of the front, which is usually deep-cleft in the middle line to form two prominent round-pointed lobes.

*Key to the Indian species of Actæa.*

I. Legs of ordinary form:—

i. The lobules of the carapace, and the legs, when granular, bear miliary or vesiculous granules of nearly uniform size, not tubercles:—

1. Length of the carapace two-thirds or less than two-thirds the breadth, postero-lateral borders extremely short and concave:—

a. Carapace and legs covered with a short dense fur, which does not, however, conceal the lobules or their granules:—

α. Fingers hollowed at tip, fur black ... *A. tomentosa.*

β. Fingers long and pointed, fur light brown ..... *A. areolata.*

b. Carapace and legs with numerous bristles, which do not form a coat; fingers blunt-pointed, but not appreciably hollowed at tip. *A. hirsutissima.*

2. Length of the carapace rather more than two-thirds the breadth, postero-lateral borders slightly concave:—

a. Legs and chelipeds lobulated in the same style as the carapace:—

α. Lobules of the carapace very markedly isolated and very convex, interlobular grooves very broad and deep, and hairy ..... *A. rufopunctata.*

β. Lobules of the carapace not remarkably isolated, the grooves with a short almost invisible fur ..... *A. speciosa.*

- b. Wrist and hands sublobular, corresponding joints of legs only a little dimpled (areolation of carapace complete) ..... *A. ruppellii.*
- c. Chelipeds and legs with a plain granular surface, areolation of carapace faint anteriorly, incomplete posteriorly:—
- a. Lobulation of antero-lateral border very indistinct, no hairs on the carapace, which is thick and convex ..... *A. obesa.*
- β. Lobulation of antero-lateral border fairly distinct the lobules being granular; a thin coat of hair:—
- α. Carapace of ordinary Actæa form ..... *A. pulchella.*
- γ. Carapace more than  $\frac{3}{4}$  as long as broad; its posterior half remarkably flat..... *A. parvula.*
- ii. Carapace covered with tubercles, legs with tubercles or spines:—
1. Carapace with plain isolated tubercles:—
- a. Carapace with pearly tubercles and granules; front bilobed, but each lobe so deeply excised as to appear itself bilobed..... *A. nodulosa.*
- b. Carapace with coarse spine-like tubercles; front broadly bilobed ..... *A. echinus.*
- c. Carapace and chelipeds with pedicled pisi-form tubercles, legs with thorns ..... *A. peronii.*
- d. Carapace, chelipeds and legs with pedicled, flat-topped tubercles which at the margins become petaloid; front bilobed, each lobe cut into four petaloid teeth..... *A. flosculata.*
2. Carapace closely covered with confluent tubercles the surfaces of which are themselves formed of confluent granules:—
- a. Tubercles of carapace very rough, raspberry-like, some of those on the legs often spiny: carapace about seven-ninths as long as broad. *A. granulata.*
- b. Tubercles of carapace smooth though pitted, those of the legs never spiny: carapace about two-thirds as long as broad..... *A. calculosa.*
- II. Propodites and carpopodites of legs dorsally bicarinate in such a way that the space between the crests appears like a trough or a series of cups:—
- i. Propodites and carpopodites each with one trough; lobules of carapace granular; front not projecting much. *A. cavipes.*
- ii. Carpopodites with at least two cups; lobules of carapace pitted as well as granular; front projecting far beyond the inner angle of the orbit..... *A. fossulata.*

63. *Actæa tomentosa*, (Edw.) A. Milne Edwards.

*Zozymus tomentosus*, Milne Edwards, Hist. Nat. Crust. I. 385, and in Cuvier. Règne An. Crust. pl. xi. bis, fig. 2.

*Actæa tomentosa*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 262, and IX. 1873, p. 191: A. Targioni Tozzetti, "Magenta" Crost. p. 35, pl. iii. figs. 14 &c.: Hilgendorf, MB. Ak. Berl. 1878, p. 788: Richters in Möbius Meeresf. Maurit. p. 145: Haswell, Cat. Austral. Crust. p. 44: Ortmann, Zool. Jahrbuch., Syst. &c., VII. 1893-94, p. 453, and in Semon's Zool. Forschungr. (Jena. Denkschr. VIII) Crust. p. 50.

*Actæodes tomentosus*, Dana U. S. Expl. Exp. Crust. pt. I. p. 197: Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 32: Heller, SB. Ak. Wien, XLIII. 1861, p. 328, and Novara Crust. p. 17: Miers, P. Z. S. 1877, p. 134; and 1879 pp. 20 and 30; and Phil. Trans. Vol. 168, 1879, p. 486; and Ann. Mag. Nat. Hist. (5) V. 1880, p. 234; and Zool. H. M. S. Alert, pp. 517 and 530; and Challenger Brachyura, p. 135: de Man, Archiv. fur Naturges. LIII. 1887, i. p. 252; and in Weber's Zool. Ergeb. Niederl. Ost. Ind. II. 1892, p. 278; and Zool. Jahrb., Syst. &c., VIII. 1894-95, p. 499: Cano, Boll. Soc. Nat. Napol. III. 1889, p. 199.

Carapace ovoid and very broad, its greatest length less than two-thirds its greatest breadth, its dorsal surface—like that of all the surfaces of the chelipeds and legs that are exposed in repose—covered, as closely and evenly as possible, with a dense short blackish felt through which peep the shiny tops of very numerous large vesiculous granules. This felt is not so long as to obscure the areolation of the carapace which is very perfect and in bold relief, but it obscures the fact that the deep-cut grooves that separate the lobules are smooth.

The lobules—excluding those of the antero-lateral and supra-orbital margins and those on the front—are 21 in number, the anterior 8 with the long diameter fore-and-aft, the posterior 5 with the long diameter transverse.

The front, which is vertically deflexed and does not break the wide even sweep of the antero-lateral borders, appears nearly equally four-lobed, the outer lobe on either side being formed by the tumid supra-orbital border.

The antero-lateral borders are long and beautifully arched; when undenuded they look entire, but when denuded they are seen to be cut by narrow clefts into four very shallow lobes of unequal size,—the clefts being continued as grooves on to the under surface of the carapace. The very short postero-lateral borders are extremely concave.

The tumid supra-orbital border is cleft into lobules by two fissures similar to the grooves of the carapace, and there is a third fissure at the outer angle of the orbit.

The whole under surface of the carapace, and the surfaces of the sternum and external maxillipeds and abdominal terga, are covered with a dense felt that obscures all the granulation that exists.



The basal antennal joint is broad, and its outer angle does not fall very far short of the inner angle of the floor of the orbit.

The legs, besides the felt and the granules (which are conical rather than vesiculous) already spoken of, have their edges—but chiefly the anterior edge—fringed with coarse tufted hair: similar hair occurs on the edges of the arm.

The fingers are short, with broadly-rounded hollowed-out tips.

Colours in spirit, as in life, blackish.

In the Indian Museum are 115 specimens from the Nicobars, Andamans, Palk Str., and Laccadives (besides 31 from Mauritius, Australia and the South Sea Is.).

#### 64. *Actæa areolata*, Dana.

*Actæa areolata*, Dana, Proc. Acad. Nat. Sci. Philad. 1852, p. 73, and U. S. Expl. Exp. Crust. pt. I. p. 162, pl. viii. figs. 1a-b: A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 264: E. Nauck, Zeits. Wiss. Zool. XXXIV. 1880. p. 54 (gastric teeth): ? Miers, Zool. H. M. S. Alert, pp. 182, 209: de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 25: Zehntner, Rev. Suisse Zool. II. 1894, p. 147.

Carapace in proportions and outline almost exactly similar to *A. tomentosa*. Its surface and the exposed surfaces of the chelipeds and legs is also covered as densely as possible with felt; but this felt is of a lighter colour, and it almost conceals the granulation, excepting 3 or 4 lines of granulation on the lower outer surface of the hands: the felt also obscures, though it does not conceal, the areolation of the carapace, owing to the lobules being less convex.

Unlike *A. tomentosa* the upper surface of the wrist and hand are nodular (as well as granular), and the fingers are long and pointed, without any hollowing of the tip.

In other respects this species closely resembles the preceding.

One specimen from Mergui.

#### 65. *Actæa hirsutissima* (Rüppell), De Haan, Dana.

*Xantho hirsutissimus*, Rüppell, 24 Krabben roth. Meer, p. 26, pl. v. fig. 6: Milne Edwards, Hist. Nat. Crust. I. p. 389.

*Actæa hirsutissima*, De Haan, Faun. Japon. Crust. p. 18: Dana, U. S. Expl. Exp. Crust. pt. I. p. 164: Heller, SB. Ak. Wien, XLIII. 1861, p. 314; and Novara Crust. p. 9: A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 263, and IX. 1873, p. 191: Kossmann, Reise roth. Meer., Crust. p. 23: Targioni Tozzetti, Magenta Crost. p. 37, pl. iii. fig. 26: Richters in Möbius, Meeresf. Maurit. p. 145: de Man, Notes Leyden Mus. II. 1880, p. 173, and III. 1881, p. 96: Cano, Boll. Soc. Nat. Napoli, III. 1889, p. 189: Ortmana, Zool. Jahrb., Syst., VII. 1893-94, p. 453.

Length of carapace =  $\frac{6}{5}$  breadth.

Carapace of much the same proportions and outline as *A. tomentosa*, but the frontal outline is more convex, and the postero-lateral borders are a little less concave.

The surface of the carapace is very completely areolated by deep smooth grooves, the lobules being exceedingly numerous, strongly convex, and closely covered with pearly granules; and between and around the bases of the granules are many short black bristles which do not form a coat or conceal the texture of the carapace.

The exposed surfaces of the chelipeds and legs are granular and bristly, like the carapace; and the carpal joints, and to a less extent the propodites are dimpled, but not distinctly nodular, above.

Under surface of carapace granular, hairy, and furrowed by grooves continued from fissures that subdivide the antero-lateral borders into four shallow lobes. The surfaces of the external maxillipeds and distal abdominal terga are bristly, those of the sternum and proximal abdominal terga are hairy.

Fingers bluntly pointed but not hollow at tip.

Colours in spirit, yellowish, fingers and greater part of hand black.

In the Indian Museum are a specimen from Samoa, a specimen without locality, and a specimen from the Audamans or Nicobars.

#### 66. *Actæa rufopunctata*, (Edw.) Heller.

*Xantho rufopunctatus*, Milne Edwards, Hist. Nat. Crust. I. 389: Lucas, Expl. Sci. Algérie, Anim. Artic. p. 11, pl. ii. fig. 1: A. Milne Edwards in Maillard's Pile Réunion Annexe F, p. 4.

*Actæa rufopunctata*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 268, pl. xviii. figs. 1, 1a: Richters in Möbius Meeresf. Maurit. p. 145: de Man, Notes Leyden Mus. II. 1880, p. 172 and III. 1881, p. 96: Miers, P. Z. S. 1881, pp. 63, 68; and Zool. H. M. S. Alert, pp. 517, 528; and Challenger Brachyura, p. 122: Carus, Prodr. Faun. Medit. I. p. 513: R. I. Pocock, Ann. Mag. Nat. Hist. (6) V. 1890, p. 75: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 357: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 454; and in Semon's Forschunger. (Jena. Denk. VIII.) Crust. p. 50.

*Actæa nodosa*, Stimpson, Ann. Lyc. Nat. Hist. N. Y. VII. 1862, p. 203; and Bull. Mus. Comp. Zool. II. 138: A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 266, pl. xvii. figs. 6-6c; and Exp. Sci. Mex., Crust. p. 245; and Bull. Mus. Comp. Zool. VIII. p. 11: Desbonne and Schramm, Crust. Guadeloupe, p. 25: J. S. Kingsley, Proc. Acad. Philad. XXXI. 1879, p. 393.

Carapace broad, ovoid, its extreme length not quite  $\frac{3}{4}$  but more than  $\frac{2}{3}$  its extreme breadth: its surface is broken, by deep and broad grooves, into numerous (about 27 excluding those round the orbits and the front) very convex lobules, which are covered very closely with large vesiculous granules; the grooves are filled with a dense short

felt—with longer hairs sometimes interspersed—against which the lobules stand out like islands. (Occasionally there are some tufts of long hair on the edge of some of the lobules).

The exposed (dorsal) surfaces of the carpal and propodal joints of the chelipeds and legs are lobulated in the same style as the carapace, the lobules being granular and being isolated by deep felted grooves.

The front is strongly deflexed, but somewhat prominent, and is rather sharply bilobed. The tumid supra-orbital margin is broken by two cross grooves, and is separated from the lower margin of the orbit by a fissure. The antero-lateral borders are cut into four rounded lobules of nearly equal size, by deepish fissures. Postero-lateral borders not appreciably shorter than the antero-lateral, and little concave.

The parts seen on the under surface are not conspicuously granular or hairy.

The basal antennal joint has its outer angle almost in contact with the inner angle of the lower edge of the orbit.

The edges of the legs (especially the upper edge) are fringed with coarse hair—as also of the arm.

The lower outer surface of the hand has the granules arranged in lines, as is the case with most species of *Actæa*. Fingers blunt-pointed, hollowed out at tip.

Colours of well-preserved spirit specimens, yellow with the convexities of some of the lobules orange-red; the felt in the grooves brown; fingers dark brown with white tips.

Five specimens from Ceylon, up to 34 fms., and four from the Andamans, up to 36 fms.

#### 67. *Actæa speciosa* (Dana), Ortmann.

*Actæodes speciosus*, Dana, U. S. Expl. Exp. Crust. pt. I. p. 198, pl. xi. figs. 4a-c: Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 32.

*Actæa speciosa*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 274: Ortmann, Zool. Jahrb. Syst. VII, 1893-94, p. 455.

*Actæodes nodipes*, Heller, Abhandl. zool.-bot. Ges. Wien, XI. 1861, p. 9, and SB. Ak. Wien, XLIII. 1861, p. 329, pl. ii. fig. 19, and Novara Crust. p. 17: A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 274: de Man, Notes Leyden Mus. II. 1880, p. 172.

? *Psæumis glabra*, Kossmann, Reise roth. Meer., Crust. p. 27, pl. i. fig. 4.

This species has a general resemblance to *A. rufopunctata*, but the carapace is relatively longer and narrower, its lobulation is much less complete and bold, and it is devoid of hairs.

Length of carapace =  $\frac{3}{4}$  the breadth.

Surface of carapace broken up by shallow grooves into numerous

lobules, which fall into series that appear to radiate from the midcardiac region. The lobules are closely covered with miliary granules, they are nowhere very convex, and on the posterior third of the carapace they are indistinct. Although the carapace looks quite bare to the naked eye, yet its whole surface—both between the granules and in the grooves between the lobules—is covered with a fine, extremely short and inconspicuous felt.

The exposed surfaces of the carpal and propodal joints of the legs and chelipeds (except the lower outer surface of the hand, which is granular in lines) has exactly the same style of sculpture and texture as the antero-lateral part of the carapace.

Two fissures in the upper edge of the orbit, but none between this and the lower edge of the orbit.

Antero-lateral borders four-lobed,—the lobes subequal and shallow. Postero-lateral borders distinctly shorter than the antero-lateral and distinctly concave.

The basal antennal joint falls far short of the inner angle of the floor of the orbit.

Edges of legs and chelipeds quite free from hair.

Fingers pointed, very slightly hollowed at tip.

Colours in spirit, yellow.

3 specimens from the Persian Gulf, Ceylon, and Andamans are in the Indian Museum.

### 68. *Actæa ruppellii* (Krauss) Hilgendorf.

*Aegle ruppellii*, Krauss, Südafr. Crust. p. 28, pl. i. fig. 1. 1843.

*Actæa ruppellii*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 270: Hilgendorf in v. d. Decken's Reisen Ost Afr. III. i. p. 73, and MB. Ak. Berl. 1878, p. 787: Miers, Ann. Mag. Nat. Hist. (5) V. 1880, p. 232, and Zool. H. M. S. Alert, pp. 183, 209: A. O. Walker, Journ. Linn. Soc., Zool., XX. 1886-90, p. 109: Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 358: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 454: de Man, Zool. Jahrb., Syst., VIII. 1894-5, p. 499.

*Aegle rugata*, Adams and White, Samarang Crust. p. 43, pl. viii. fig. 5.

*Actæa rugata*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 269, and IX. 1873, p. 192: R. Etheridge jr., Mem. Austral. Mus. No. 2, 1889, pp. 33, 35: de Man, Notes Leyden Mus. XIII. 1891, p. 1, and in Weber's Zool. Ergebn. Niederl. Ost-Ind. II. 1892, p. 277: Whitelegge, Mem. Austral. Mus. III. 1897, p. 129.

*Actæa rufopunctata*, de Man (*nec* Edw.) Archiv. fur Naturges. LIII. 1887, i. p. 261, and Journ. Linn. Soc., Zool., XXII. 1887-88, p. 26 (see Notes Leyden Mus. XIII. 1891, p. 1).

Carapace  $\frac{3}{4}$  as long as broad; it and the exposed surfaces of the legs covered with a shaggy coat—consisting of a sponge-work of short bristles amid which are numerous long silky tangled hairs—which has

to be removed before the sculpture and texture of the carapace can be properly made out.

On the denuded carapace the lobules are numerous, are arranged in series which appear to radiate from the cardiac region, and are somewhat indistinct quite posteriorly, but are elsewhere distinct, moderately convex, and separated by broad smooth furrows.

Front obliquely deflexed, rather sharply bilobed. Supra-orbital margin moderately tumid, narrow, cut by two fissures and separated from the lower edge of the orbit by a fissure. Antero-lateral borders four-festooned, the first and last lobes much smaller than the others. Postero-lateral borders shorter than the antero-lateral, moderately concave.

Exposed (dorsal) surfaces of the chelipeds and legs granular and shaggy: the wrist and upper surface of the hand are also subnodular, but the corresponding joints of the legs are but indistinctly grooved. Lower outer surface of hand with granules in lines that are not so definite as usual. Fingers blunt-pointed, slightly hollowed at tip.

Basal antennal joint broad: it falls short of the inner angle of the orbit.

Colours in spirit yellow, fingers dark brown with white tips: in some specimens faint orange-red spots exist on some of the lobules of the carapace.

Carapace markedly more convex in the female than in the male.

In the Indian Museum are 30 specimens from Malacca Str., Andamans, Meigui, Ceylon, and Persian Gulf.

#### 69. ? *Actæa obesa*, A. Milne Edwards.

*Actæa obesa*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 272, pl. xvii. figs. 2-2b.

This species, if my identification be correct, differs from *Actæa ruppellii*, which it closely resembles, in the following characters:—

(1) the carapace and legs are not shaggy, and though they bear some hairs these do not in any way conceal the texture of the carapace:

(2) the lobulation is quite absent from the posterior third of the carapace; and elsewhere though quite distinguishable, is extremely faint, owing to the fineness of the grooves:

(3) the entire surface of the carapace—grooves as well as lobules—is covered with crisp granules, which are largest in the middle of the branchial regions:

(4) the lobulation of the antero-lateral borders, though distinguishable, is extremely indistinct, especially in the case of the first lobe:

(5) the postero-lateral borders are more concave :

(6) the dorsal surfaces of the chelipeds and legs are crisply granular, but the carpal joints show almost no dimpling and the propodal joints none at all.

In the Indian Museum are 2 specimens from the Malacca Straits and one from Bombay.

70. ? *Actæa pulchella*, A. Milne Edwards.

*Actæa pulchella*, A. Milne Edwards, *Nouv. Archiv. du Mus.* I. 1865, p. 273, pl. xvii, figs. 5-5b.

? *Actæodes modestus*, de Man, *Archiv. für Naturges.* LIII. 1887, i. p. 257, pl. ix, fig. 3.

This species, if my identification be correct, resembles *Actæa ruppellii* and *obesa*, but has the following differential characters:—

(1) the carapace is altogether less convex :

(2) the lobulation of the carapace is defective posteriorly, and is faint anteriorly owing to the fineness of the grooves :

(3) the entire surface of the carapace and dorsal surface of legs and chelipeds is covered (though not crowded) with crisp granules, most of which carry a short bristle—but these bristles are not close enough to form a coat :

(4) the antero-lateral borders are sharply granular, but their lobulation is very indistinct :

(5) except for a furrow across the wrist parallel with the articulation of the hand, the sharply granular surface of the chelipeds and legs is unbroken.

In the Indian Museum are three specimens from Mergui, the Andamans, and Ceylon.

71. *Actæa parvula*, (De Haan), de Man.

*Menippe parvulus*, De Haan, *Faun. Japon. Crust.* p. 21 : Krauss, *Sudafr. Crust.* p. 34, pl. ii, fig. 2.

*Actæa parvula*, de Man, *Journ. Linn. Soc., Zool.*, XX. 1887-88, p. 27.

Carapace more than  $\frac{3}{4}$  as long as broad, with the posterior third or more *depressed, perfectly flat*, and almost or quite devoid of areolation ; its surface is everywhere covered with vesiculous granules, which become very small posteriorly, and with a fine short velvety hair : the areolation is fairly profuse and quite distinct in the anterior two-thirds.

Antero-lateral borders divided into four granular lobes : postero-lateral borders less convergent than in any other species of *Actæa*, giving the flattened posterior part of the carapace a most abnormal look

for an *Actæa*. Front deeply cleft into two round-pointed lobules. The three grooves near the outer angle of the orbit are fairly distinct.

Upper and outer surface of wrist and hand covered with pearly granules and velvet: fingers pointed, not hollowed at tip.

The exposed parts of the dorsal surface of the legs are also covered with velvet which conceals their sharply granular sculpture. Last pair of legs rather short.

Colours in spirit yellow or brownish, fingers brown.

In the Indian Museum are 3 specimens, from the Andamans and Mergui.

This species may be distinguished from all its congeners by the very moderate difference between the two diameters of the carapace, which also has its posterior part quite flat.

## 72. *Actæa cavipes*, (Dana), A. Milne Edwards.

*Actæodes cavipes*, Dana, Proc. Acad. Nat. Sci. Philad., 1852, p. 78, and U. S. Expl. Exp., Crust. pt. I. p. 199, pl. xi. figs. 5a-b.

*Actæa cavipes*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 280, and IX. 1873, p. 193: Ortmann, Zool. Jahrb. Syst. VII. 1893-94, p. 456, and in Semon's Zool. Forschungsgr. (Jena. Denk. VIII) Crust. p. 50.

Carapace about  $\frac{2}{3}$  as long as broad, completely lobulated, the lobules being covered with miliary granules and being separated by broad but not very deep grooves: the posterior part of the carapace sometimes has a worm-eaten appearance.

Front obliquely deflexed, with a cupid's-bow-shaped edge, hardly projecting beyond the prominent inner angle of the lower edge of the orbit. Orbital margin unfissured and unbroken. Antero-lateral borders 4, or indistinctly 5, lobed, the lobes granular and uneven, but not pitted. Postero-lateral borders very much shorter than the antero-lateral, concave.

Outer surface of wrist with numerous pits and craters, upper outer surface of hand worm-eaten.

The upper edges of the carpal and propodal joints of the legs have each a double longitudinal crest, and in every joint the ends of the crests meet so as to leave a trough-like space between them.

The basal antennal joint almost touches the inner angle of the orbit.

Fingers long, pointed, slightly hollow at tip.

In the Indian Museum are four specimens from the Andamans, Mekrán Coast, and Persian Gulf (besides specimens from Upolu and Mauritius).

73. *Actæa fossulata* (Girard) A. M. Edw.

*Cancer fossulatus*, Girard, Ann. Soc. Entom. France (3) VII. 1859, p. 149, pl. iv. figs. 2-2b.

*Actæa schmardæ*, Heller, Abh. zool.-bot. Ges. Wien, 1861, p. 6 and SB. Ak. Wien, XLIII. 1861, p. 318, pl. i. fig. 13.

*Actæa fossulata*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 279, and IV. 1868, p. 71 : Richters in Möbius Meeresf. Maurit. p. 145.

*Psaumis fossulata*, Kossmann, Reise roth. Meer., Crust. p. 27, pl. i. fig. 3.

Closely resembles *Actæa cavipes*, but has the following difference:—

(1) the front projects far beyond the inner angle of the orbit :

(2) the lobes of the carapace have their convexity distinct but boundaries somewhat indistinct; and in addition to being granular, they are deeply pitted, and this gives the whole carapace a worm-eaten look :

(3) the antero-lateral borders are four-lobed, but the first lobe is very indistinct, and the lobes are marked with rather large pits :

(4) the upper edge of the hand is bluntly crested and the neighbouring surface is pitted rather than eroded :

(5) the crest of the carpal joints of the legs do not only meet at their ends, but are also more or less completely joined across the middle by dissepiments, so that instead of enclosing a single trough they form at least two irregular cup-like cavities.

In the Indian Museum are two specimens from Great Coco I. (Andamans), and East I., Andamans.

74. *Actæa nodulosa*, White.

*Actæa nodulosa*, White, P. Z. S. 1847, p. 224 : Ann. Mag. Nat. Hist. (2) II, 1848, p. 224; and Adams and White, Samarang Crust. p. 39, pl. viii, fig. 4 : A. Milne Edwards, in Maillard's Île Réunion, Annexe F, p. 5; and Nouv. Archiv. du Mus. I. 1865, p. 277 : Miers, Challenger Brachyura, p. 120 : Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 356.

Carapace  $\frac{2}{3}$  as long as broad, much subdivided by smooth well cut grooves into numerous small lobules. These lobules are rather irregularly studded with pearly tubercles and granules, the slight irregularity in size and distribution of which gives the lobules themselves a somewhat irregular look. On several of the lobules of the gastric cardiac and branchial regions are, sometimes, symmetrically disposed tussocks of long coarse whitish hair.

The obliquely deflexed front is sharply four-lobed or four-toothed, the outer lobe on either side (standing at the orbital angle) being small. The beaded supra-orbital margin is broadly fissured twice and is separated from the infra-orbital margin by a fissure. The antero-



lateral borders are sharply four-lobed, each lobe being rasp-like. The postero-lateral borders are a little concave. The posterior border is formed by a row of bead-like granules, in front of which is another row—broken in the middle—of larger beads. The sternum, and the under surface of the carapace as far as the beaded epimeral suture, are covered with vesiculous granules.

Those surfaces of the chelipeds and legs that are exposed in repose are closely and crisply granular, many of the granules being pearl-like or bead-like, and those along the dorsad border being spine-like: the edges of the legs, especially the upper edge, are hairy. The granules on lower outer surface of hand are arranged as usual in lines.

Fingers short, pointed, not hollow at tip.

The basal antennal joint falls far short of the inner angle of the floor of the orbit.

Colours in spirit, white.

In the Indian Museum are 3 specimens from off the Malabar Coast, 28-29 fms., one from the Persian Gulf, and one from the Andamans.

*Actæa nodulosa* var. *bullifera*.

In this well-marked and very ornamental variety the lobulation of the carapace—both of its surface and of its antero-lateral borders—is as deeply cut, as convex, and as regular as it is in *Actæa rufopunctata*; the tubercles are more of one size, and have a distinct constricted base and a swollen spherical pearl-like top; the front row of pearly granules of the posterior border is unbroken; the front is more bilobed with sinuous edges than four-lobed, and its edge is elegantly denticulated or beaded; and all the parts of the under surface of the body are finely granular, except the sternum, which has a pitted worm-eaten look.

Length of carapace 10 millim., breadth 14·5 millim.

A single female from the Andamans.

75. *Actæa echinus*, n. sp.

Closely resembles *Actæa nodulosa* White, but has the following difference:—

(1) instead of pearly tubercles we find coarse conical tubercles or tooth-like spines with denticulated tops; and on the chelipeds and antero-lateral borders of the carapace are coarse serrated spines:

(2) the front is broadly bilobed, the angles of the lobes being sharp:

(3) the lobulation of the antero-lateral borders is irregular and indistinct:

(4) the legs are thin and compressed, the dorsad border of the carpal and propodal joints forms a serrated crest, and the slightly

granular sculpture of the upper surfaces of these joints and of the meropodites is concealed by a close short spongy growth of hair.

Colours in spirit yellow, fingers brown.

Length of carapace 17.5 millim., breadth 26 millim.

A single male from off the Malabar Coast 29 fms.

This species (?) may perhaps be only a variety of *A. nodulosa*. I have noticed it separately, and have figured it, on account of the resemblance it bears to Herbst's *Cancer polydora* (Krabben III. ii. 33, pl. lii. fig. 2).

#### 76. *Actæa peronii*, (Edw.) Haswell.

*Xantho peronii*, Milne Edwards, Hist. Nat. Crust. I. 392: Hess, Archiv. für Naturges. XXXI. 1865, i. pp. 133, 171.

*Xantho spinosus*, Hess, Archiv. für. Nat. XXXI. 1865, pp. 132, 171: de Man, Zool. Jahrb., Syst., II. 1887, pp. 690, 692.

*Actæa peronii*, Haswell, Cat. Austral. Crust. p. 46: Miers, Challenger Brachyura, p. 122: de Man, Zool. Jahrb. Syst., II. 1887, pp. 690, 692: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 357.

? *Chlorodius polyacanthus*, Heller, Abh. zool.-bot. Ges. Wien, 1861, p. 11; SB. Ak. Wien, XLIII. 1861, p. 339, pl. ii. fig. 21.

Carapace  $\frac{2}{3}$  as long as broad, only moderately convex, the lobulation distinct but not convex, covered with strongly convex well-isolated smooth polished tubercles, which are largest on the branchial regions and are smallest posteriorly, where also they become somewhat squamiform. On the antero-lateral borders are four (excluding a tubercle of the supra-orbital series) large tubercles, much similar to those on the branchial regions, but more prominent (almost stalked) and with larger tops (almost pisiform).

Exposed surfaces of wrist and hand covered with tubercles much like those of the branchial regions, but more prominent: on the lower outer surface of the hand they become almost squamiform: a few tubercles at the distal inner corner of the arm.

Exposed surfaces of carpal and propodal joints of legs covered with stout thorns: smaller thorns on upper edge of meropodites, and still smaller ones on surface of dactyli except on the claw.

Front broadly bilobed: each lobe with an S-shaped curve to the edge and with the outer angle pronounced.

Fingers short, blunt pointed, hardly hollow at tip.

The basal antennal joint stops far short of the inner angle of the floor of the orbit.

Colours in spirit light yellow, fingers dark brown.

In the Indian Museum are 3 specimens from Australia but none from India. It is included here on the authority of Dr. J. R. Henderson.

77. *Actæa flosculata*, n. sp.

Nearest to *Actæa acantha*, A. M. E., and *A. hystrix*, Miers.

Characterized by the close investment (carapace, chelipeds and legs) of peculiarly ornamental fungiform tubercles which become petaloid at the margins.

Carapace  $\frac{3}{4}$  as long as broad, convex; all the regions well defined by conspicuous grooves, and convex; the regions again subdivided into few convex lobules by less conspicuous grooves. The whole carapace, except the broader grooves between the regions, closely covered with very elegant tubercles which have constricted stalk-like bases and thin broad oval or kidney-shaped tops. The exposed surfaces of the chelipeds and legs are covered with ornaments similar to those on the carapace, except at the edges, where they become petaloid.

Front broadly bilobed, the edge of each lobe being deeply cut into four projecting petals. Supra-orbital margin deeply scalloped: antero-lateral borders ornamented like the surface, obscurely lobed: postero-lateral borders about equal in length to the antero-lateral, straight.

The terminal abdominal terga and the sternum of the male pitted and worm-eaten, but with a glazed appearance: under surface of carapace, as far as the epimeral suture, covered with pearly granules.

The basal antennal joint stops far short of the inner angle of the floor of the orbit.

Fingers short, blunt pointed, slightly hollow at tip.

Colours in spirit light yellow, fingers brown with white tips.

In the Indian Museum are two specimens from off Ceylon, 34 fms. and one from off Maldive Is. 28 fms. The carapace of the larger one is 8 millim. long and 12 millim broad.

The ornamentation of this species gives it a strong resemblance to *Chlorodius fragifer* White, with which it may probably prove to be identical.

78. *Actæa granulata* (Audouin).

*Cancer granulatus*, Savigny and Audouin, Description de l'Égypte, Crust. pl. vi. fig. 2.

*Cancer savignyi*, Milne Edwards, Hist. Nat. Crust. I. 378.

*Cancer (Actæa) granulatus*, De Haan, Faun. Japon. Crust. p. 47.

*Actæa carcharias*, White, P. Z. S. 1847, p. 224, Ann. Mag. Nat. Hist. (2) II. 1848, p. 284: A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 276.

*Actæa pura*, Stimpson, Proc. Acad. Nat. Sci. Philad. 1858, p. 32.

*Actæa granulata*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 275, and IX. 1873, p. 192: Miers, Cat. Crust. New Zealand, p. 16; and P. Z. S. 1879, pp. 20, 30; and Challenger Brachyura, p. 120: Haswell, Cat. Austral. Crust. p. 44:

Filhol, Crust. New Zealand, p. 373 : J. R. Henderson, Trans. Linn. Soc., Zool. (2) V. 1893, p. 356 : Ortmann, Zool. Jahrb., Syst. VII. 1893-94, p. 455.

*Actæa Savignii*, Kossmann, Reise roth. Meer., Crust. p. 25 : Hilgendorf, MB. Ak. Berl. 1878, p. 787 : Cano, Boll. Soc. Nat. Napol. III. 1889, p. 189.

Carapace nearly  $\frac{7}{9}$  as long as broad, of a mulberry-like appearance, owing to its entire surface being covered with rough tubercles in the closest possible contact with one another by the base. Each individual tubercle again has a mulberry-like appearance, since it is formed of a number of faceted granules confluent by their bases.

The lobulation of the carapace is very complete, but is almost lost in the polygonal mosaic of tubercles.

The 4-lobulation of the antero-lateral borders is inconspicuous.

The postero-lateral borders are shorter than the antero-lateral, and are markedly concave.

Front sharply bilobed, the lobes projecting far beyond the well pronounced orbital angle. Orbital margin with three closed sutures.

The exposed surfaces of the chelipeds are covered with the same strong many-faceted tubercles as the carapace; but on the legs the tubercles have sharper points and are many of them spiny, especially those on the dactyli.

The abdominal terga and the greater part of the sternum are covered with a mosaic of smooth-worn tubercles: the under wall of the carapace, as far as the epimeral suture, is granular.

Fingers short, blunt pointed, hardly hollow at tip.

Basal antennal joint prolonged between front and orbit almost to the inner angle of the orbit, very much as in *Carpilius* etc.

Colour in spirit light reddish brown, fingers black with white tips: in life the colour is uniform purplish black.

In the Indian Museum are 10 specimens from the Persian Gulf, Karáchi, Pedro Shoal, Ceylon, Ganjam Coast, Mergui, and Malacca (besides 14 specimens from Australia and Hongkong).

#### 79. *Actæa calculosa*, (Edw.) A. M. Edw.

*Cancer calculosus*, Milne Edwards, Hist. Nat. Crust. I. 378.

*Actæa calculosa*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 276, pl. xviii. figs. 3-3a : Haswell, Cat. Austral. Crust. p. 45 : J. R. Henderson, Trans. Linn. Soc., Zool. (2) V. 1893, p. 356.

Not very easily distinguishable from *Actæa granulata* at first sight, but the following difference is constant:—

(1) the carapace is shorter and broader, its length being only about two-thirds its breadth:

(2) the tubercles of the carapace and chelipeds are much smoother

and are hardly faceted, owing to the granules of which they are formed being more intimately confluent; and on the posterior part of the carapace the tubercles themselves are confluent, small, and little convex: the tubercles of the legs are never spiny:

(3) the regions and lobules of the carapace are much more distinctly delimited, and the 4-lobulation of the antero-lateral borders is more distinct.

Colours in spirit much as in *A. granulata*.

In the Indian Museum are 8 specimens from the Persian Gulf, Karáchi, and Mergui.

#### BANAREIA, A. Milne Edwards.

*Banareia*, A. Milne Edwards, Ann. Soc. Entomol. France (4) IX. 1869, p. 168, and Nouv. Archiv. du Mus. IX. 1873, p. 193.

Strongly resembles *Actæa* in all points but has the following difference:—

(1) in the fore edge of the buccal cavern is, on either side, a deep gap, not a mere suture or fissure such as is seen in some species of *Actæa*:

(2) the fingers are compressed and extremely trenchant, resembling shears.

#### 80. *Banareia armata*, A. Milne Edwards.

*Banareia armata*, A. Milne Edwards, Ann. Soc. Ent. Fr. (4) IX. 1869, p. 168, pl. viii; and Nouv. Archiv. du Mus. IX. 1873, p. 193: Ortmann, Zool. Jahrb., Syst., VII. 1893, p. 456: de Man, Jahrb. Hamb. Wiss. Anst. XIII. (Brachyuren des Hamb. u. Paris Mus.) 1896, p. 75.

Outwardly, from the dorsal view, might almost be mistaken for *Actæa ruppellii*.

All exposed parts of the carapace and appendages, except the fingers and lower outer surface of the hand are concealed by a dark shaggy covering consisting of a dense under-fur with numerous tufts of long hair.

The carapace is a little more than  $\frac{2}{3}$  as long as broad, and when denuded, is seen to be divided into very numerous small lobules by broad smooth grooves. The lobules are convex and closely covered with pearly granules.

The front is formed of two small pointed lobes which do not break beyond the common curve of the antero-lateral borders: the supra-orbital border is fissured twice, and is separated from the lower border of the orbit by a fissure: the antero-lateral borders, when denuded, are seen to be divided into four granular lobes of unequal size, and a

(fifth) granular tubercle exists just behind the orbit: the postero-lateral borders are very distinctly concave, and are much shorter than the antero-lateral borders.

The outer surface of the wrist, when denuded, has much the same sculpture as the carapace. An oblique patch of the lower outer surface of the hand is smooth and polished and quite devoid of hair, as are the fingers except the basal half of the upper edge of the dactylus. The upper outer surface of the hand, when denuded, shows about six longitudinal lines of granules, the three upper of which are a little diffuse.

The fingers are compressed and trenchant, resembling shears: the cutting edge of the dactylus is entire, but that of the thumb has three incisiform teeth of unequal size at the base. In marked contrast to all other parts, the fingers are smooth and polished.

In the Indian Museum are 3 specimens from the Andamans.

It appears to me to be quite consistent at present to separate this species from *Actæa* while uniting *Actæodes* with that genus, for the good reason that in this case there are no known transitional forms.

#### DAIRA, De Haan.

*Daira*, De Haan, Faun. Japon. Crust. p. 18.

*Lagostoma*, Milne Edwards, Hist. Nat. Crust. I. 387.

*Daira*, Dana, U. S. Expl. Exp. Crust. pt. I, p. 202.

*Daira*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 297; and Miss. Sci. Mex., Crust. p. 248.

Carapace broad, strongly convex in both directions, the regions well delimited and subdivided into very numerous convex lentil-like lobules; its antero-lateral borders strongly arched, crenulate; its postero-lateral borders concave, very short.

Front deflexed, two-lobed—the lobes being conspicuous and prominent.

Orbital margin thickened and smoothly crenulate; a strong suture line in the lower margin. Eyes on short thick sub-globular stalks.

Antennules folding obliquely owing to the large size of the basal joint: interantennular septum broad.

Basal antennal joint hardly touching the front, the next joint and the very short flagellum wedged in the gap between the orbit and the front.

*Merus of the external maxillipeds with a wide and deep notch in the anterior margin.*

The chelipeds are unequal in both sexes; the fingers are blunt-pointed and hollowed-out at tip.

Upper edge of merus of chelipeds and legs crest-like and elegantly serrated, upper edge of the succeeding joints of the legs with a crest of stout sharp spines; but all this ornamentation is concealed by a broad thick fringe of long coarse hair.

Abdomen of male with all seven joints distinct, but the 3rd-5th segments are not movable on one another.

On either side of the endostome is an oblique septum defining the efferent branchial canal, but this septum extends only about half-way across the palate.

### 81. *Daira perlata*, (Herbst) De Haan.

*Cancer perlatus*, Herbst, Krabben, I. ii. 265, pl. xxi. fig. 122.

*Cancer daira*, Herbst, Krabben, III. ii. 6, pl. liii. fig. 2.

*Cancer variolosus*, Fabricius, Ent. Syst. Suppl., p. 338.

*Daira perlata*, De Haan, Faun. Japon. Crust. p. 18.

*Lagostoma perlata*, Milne Edwards, Hist. Nat. Crust. I. 387.

*Daira variolosa*, Dana, U. S. Expl. Exp. Crust. pt. I. p. 202, pl. x. figs. 4a-d.

*Daira perlata*, Stimpson, Proc. Ac. Nat. Sci. Phila. 1858, p. 32: A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 298; and IX. 1873, p. 196: Heller, Novara Crust. p. 18: Miers, Cat. Crust. New Zealand, p. 18; and Phil. Trans. Vol. 168, 1879, p. 487: Richters, in Möbius Meeresf. Maurit. p. 147: Filhol, Crust. New Zealand, p. 374: R. I. Pocock, Ann. Mag. Nat. Hist. (6) V. 1890, p. 74: Ortman, Zool. Jahrb., Syst., VII. 1893-94, p. 474; and in Semon's Forschungr. (Jena. Denk. VIII.) Crust. p. 52: Whitelegge, Mem. III. Austral. Mus., 1897, p. 131.

Carapace oval, strongly convex, subdivided into very numerous polished lentil and pea-shaped lobules which have their surface finely pitted. Antero-lateral borders 11 or 12-crenulate: postero-lateral borders very short, concave.

Upper and outer surface of wrist lobulated almost like the carapace; of hand and dactylus covered with coarse sharp tubercles, which become almost spiniform on the upper edge: upper part of inner surface of wrist and hand covered with a mosaic of flat markings that look like ground-down tubercles: much the same sort of mosaic occurs on the outer surface of the arm and legs, but on the dactyli and propodites of the legs the tubercles are either spiny or acute, and at the distal end of the carpus there is a spine.

Fingers short and thick, with blunt hollowed-out tips, those of the larger cheliped have the cutting-edge toothed, those of the smaller cheliped have a plain sharp cutting-edge.

Lower edge and surface of meropodites of legs much excavated in their distal half to receive the bulging distal end of the carpus in flexion.

Upper edge of legs fringed thickly with coarse long hair which

conceals their serrated and spiny sculpture. Two brushes of hair on the under surface of the dactyli.

Colours in spirit—mottled shades of warm brown.

In the Indian Museum are 11 females and 3 small males from the Laccadive reefs (besides 5 females and 1 small male from Mauritius and 2 females from Samoa).

### Subfamily III. CHLORODINÆ.

#### Alliance I. *Xanthodioda*.

#### XANTHODES, Dana.

*Xanthodes*, Dana, Proc. Acad. Nat. Sci. Philad. 1852, p. 75; and U. S. Expl. Exp. Crust. pt. I. p. 175.

*Xanthodes*, A. Milne Edwards, Ann. Sci. Nat. Zool. (4) XX. 1863, p. 227; Nouv. Archiv. du Mus. IX. 1873, p. 200; and Miss. Sci. Mex., Crust. p. 259.

*Xanthodes*, Miers, Challenger Brachyura, p. 127.

[Type *Xanthodes lamarckii* (Edw.)]

Carapace thick but somewhat depressed, moderately broad, somewhat hexagonal, the regions delimited and to a certain extent areolated in the anterior two-thirds.

Fronto-orbital border considerably more than half the greatest width of the carapace in extent.

Front broad (contained about  $3\frac{1}{2}$  times in the greatest width of the carapace) bilobed.

Antero-lateral border cut into four lobes or teeth. Orbital margin with the three grooves either fairly distinct, or quite indistinct.

Basal antennal joint broad and very short; the flagellum, which is rather longer than the orbit, lodged in the orbital hiatus.

Anterior edge of merus of external maxillipeds almost transverse.

Chelipeds either equal or unequal in both sexes; the arm in repose is nearly or quite hidden beneath the carapace; fingers pointed, not hollowed at tip.

Legs stoutish, more or less hairy and granular or spiny along the upper border.

Abdomen of the male five-jointed.

Of the two Indian species included in this genus, one (*Xanthodes lamarckii*) has a certain resemblance to *Lioxantho punctatus*, from which it is easily distinguished by the breadth of the fronto-orbital margin; the other (*Xanthodes notatus*) has a strong resemblance to *Phymodius sculptus*, from which it is at once distinguished by the sharp-pointed fingers, not hollow at tip.



*Key to the Indian species of Xanthodes.*

- I. Chelipeds equal, hands and wrists closely granular, outer surface of hand with three deep parallel longitudinal furrows ..... *X. lamarckii*.
- II. Chelipeds markedly unequal, hands and wrists, at any rate of the smaller cheliped, studded with sharp spine-like tubercles ..... *X. notatus*.

82. *Xanthodes lamarckii* (Edw.).

*Xantho lamarckii*, Milne Edwards, Hist. Nat. Crust. I. 391: A. Milne Edwards, in Maillard's Pile Réunion, Annexe F, p. 4: Heller, Novara Crust. p. 10: Ortmann, Zool. Jahrb. Syst. VII. 1893-94, pp. 444, 448.

*Xanthodes lamarckii*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 200, pl. vii. fig. 3: Hilgendorf, MB. Ak. Berl. 1878, p. 789: Miers, Zool. H. M. S. Alert, pp. 517, 529: F. Muller, Verh. Ges. Basel, VIII. 1886, p. 474: de Man, Archiv. für Naturges. LIII. 1887, i. p. 263; and in Weber's Zool. Ergebn. Niederl. Ost-Ind. II. 1892, p. 278; and Zool. Jahrb. Syst. VIII. 1894-95, p. 513: Whitelegge, Mem. Austral. Mus. III. 1897, p. 130.

*Xanthodes granosomanus*, Dana, Proc. Ac. Nat. Sci. Philad. 1852, p. 75; and U. S. Expl. Exp. Crust. pt. I. p. 175, pl. viii. figs. 10a-c.

*Xantho granosomanus*, Heller, Novara Crust. p. 11.

The anterior and antero-lateral parts of the carapace are to a variable extent granular, the posterior part is generally quite smooth.

Fronto-orbital region marked off by a sinuous groove, gastric region well delimited and fairly distinctly divided into 3 sub-regions, branchio-hepatic regions incompletely traversed by 2 grooves proceeding from the 2nd and 3rd intervals of the antero-lateral border: no other grooves on the carapace.

Outer angle of front not very pronounced, separated from the supra-orbital margin by a faintish groove. The grooves of the orbital margin are almost indistinguishable.

Antero-lateral border divided into four broadish granular lobes, the last two of which are more acuminate (but bluntly) than the others.

Chelipeds equal in both sexes, stout, rather short (less than twice the length of the carapace); arm hidden beneath the carapace in repose, its anterior and posterior edges hairy, the upper part of its posterior surface granular: upper and outer surfaces of wrists and hands as closely as possible covered with pearly granules, the wrist also has a few indistinct dimples, and the outer surface of the hand is deeply scored by three parallel longitudinal furrows: fingers rather long, pointed.

Upper edge of meropodites of legs very finely serrulate: surfaces of next three joints closely granular in the vicinity of the upper (anterior)

edge: some longish hairs scattered along the upper border of the last four, and also along the ventral (posterior) borders of the last two joints.

Colours in spirit: yellowish white, fingers blackish-brown. In well preserved spirit specimens the legs are banded with bluish green, and large confluent bluish green blotches occur on the carapace.

In the Indian Museum are 15 specimens, from the Andamans, Madras coast and Ceylon, (besides 6 from parts outside India).

### 83. *Xanthodes notatus*, Dana.

*Xanthodes notatus*, Dana, Proc. Ac. Nat. Sci. Philad. 1852, p. 76, and U. S. Expl. Exp. Crust. I. p. 178, pl. viii. figs. 12a-b: A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 201: Haswell, Cat. Austral. Crust. p. 49: de Man, Archiv. f. Naturges. LIII. 1887, i. p. 264.

*Xantho notatus*, Heller, Novara Crust. p. 10.

Surface of carapace, except for the characteristic deep cut areolation, quite smooth to the naked eye. Deep well-cut grooves separate the fronto-orbital region, define the gastric region, and subdivide the branchio-hepatic regions into 3 or 4 lobules; and the gastric region is divided into 3 sub-regions by fine but well-cut lines.

Front bilobed, the outer angle of each lobe being well defined and separated from the supra-orbital margin by a notch and groove. The 3 grooves of the orbital border are distinct.

Antero-lateral border cut into 4 teeth, of which the last two are procurved and spine-like.

Chelipeds markedly unequal, the larger one more than twice the length of the carapace: the arm in both is not quite concealed by the carapace, is devoid of hair, and has the distal end of the upper border spinate: in the smaller cheliped, the upper and outer surfaces of the wrist and the upper and a large part of the outer surface of the hand are studded with sharp spine-like tubercles; but in the larger cheliped the tubercles are larger, less numerous, and are low and worn, not spine-like: the fingers are pointed, not hollowed at tip, and in the smaller cheliped are fluted, the ridges of the dactylus having a few sharpish tubercles at the basal end.

The upper edge of the meropodites of the legs is spiny, with a few long fine bristles: the upper borders of the next two joints have each two rows of spines and a good many long bristles, the carpus having also a third row of sharp granules: the dactylus is granular and bristly, and the lower edge also of the propodite has some bristles.

Colours of well-preserved spirit specimens: purplish brown, the purplish tinge very distinct on the chelipeds, the last 3 joints of the legs are greenish.

In the Indian Museum are 17 specimens, from the Andamans, Palk Str. and Ceylon.

This species has a strong likeness to *Phymodius sculptus*.

Alliance II. *Chlorodioda*.

Chlorodius.  
Phymodius.

Chlorodopsis.  
Cyclodius.

CHLORODIUS, A. Milne Edwards.

*Chlorodius*, (part) Milne Edwards, Hist. Nat. Crust. I. 399.

*Chlorodius*, (part) Dana, Silliman's Amer. Journ. Sci. and Arts (2) XII. 1851, p. 126, and U. S. Expl. Exp. Crust. pt. I. p. 204.

*Chlorodius*, A. Milne Edwards, Ann. Sci. Nat. Zool. (4) XX. 1863, p. 283; Nouv. Archiv. du Mus. IX. 1873, p. 212; Miss. Sci. Mex., Crust. p. 265.

[Type *Chlorodius niger* (Forsk.)]

Carapace depressed, flat, hexagonal, the regions faintly or not at all demarcated, the surface smooth and almost unbroken, except sometimes on the branchio-hepatic region, near the antero-lateral border, where there may be some broad transverse wrinkles.

Fronto-orbital border more than three-fourths the greatest breadth of the carapace. Front almost straight, faintly emarginate in the middle line, extremely broad (between a third and half the greatest breadth of the carapace), its outer angles separated from the supra-orbital margin by a groove.

Antero-lateral borders cut into four lobes or teeth, the first being in very close approximation to the angle of the orbit. Postero-lateral borders rather longer than the antero-lateral.

Orbit with two suture lines above, and one at the outer angle: eyes on short thick stalks.

Basal antennal joint large, extending upwards and outwards into the gap between the front and the orbit; the flagellum situated in the crevice-like orbital hiatus.

Merus of the external maxillipeds with the anterior border almost transverse.

Chelipeds unequal, long, more than twice the length of the carapace, half or more of the arm projecting beyond the edge of the carapace; fingers large, broadened and deeply hollowed at tip (horse-shoe shaped).

Legs never spiny, though the upper edge of the meropodites may have a few spinules distally, and that of the following joints is sharply granular.

Abdomen of the male consisting of 5 joints, the 3rd-5th somites being fused.

*Key to the Indian species of Chlorodius.*

- I. Carapace with the regions faintly marked, transversely wrinkled near the antero-lateral borders; four distinct teeth (exclusive of the orbital angle) on the antero-lateral border ..... *C. niger.*
- II. Carapace with a perfectly smooth unbroken surface; first lobe of antero-lateral margin almost obsolete, the third the most distinct of all ..... *C. lævissimus.*

84. *Chlorodius niger* (Forsk.) Rüppell, A. M. Edw.

*Cancer niger*, Forskal, Descr. Anim. p. 89.

*Chlorodius niger*, Rüppell, 24 Krabben roth. Meer. p. 20, pl. iv. fig. 7 and pl. vi. fig. 14: Milne Edwards, Hist. Nat. Crust. I. 401: Dana, U. S. Expl. Exp. Crust. pt. I. p. 216, pl. xii. figs. 5a-c: Stimpson, Proc. Ac. Nat. Sci. Phila., 1858, p. 33: Heller, SB. Ak. Wien, XLIII. 1861, i. p. 335, and Novara Crust. p. 18: A. Milne Edwards, Nouv. Archiv. du Mus. IV. 1868, p. 71, and IX. 1873, p. 214: Kossmann, Reise roth. Meer. Crust. p. 34: Miers, Ann. Mag. Nat. Hist. (5) V. 1880, p. 234; and P. Z. S. 1884, pp. 10, 11; and Zool. H. M. S. Alert, pp. 183, 215, 517, 531: de Man, Notes Leyden Mus. II. 1880, p. 174, III. 1881, p. 98, and Archiv. für Naturges. LIII. 1887, i. p. 279, and Journ. Linn. Soc., Zool., XXII. 1887-88, p. 32; and Zool. Jahrb. Syst. VIII. 1894-95, p. 519: Richters in Möbius Meeresf. Maurit. p. 147: Haswell, Cat. Austral. Crust. p. 62: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 361: Ortmann, Zool. Jahrb. Syst. VII. 1893-94, p. 465, and in Semon's Forschungsr. (Jena. Denk. VIII.) Crust. p. 51.

*Chlorodius hirtipes*, White, P. Z. S. 1848, p. 226; Ann. Mag. Nat. Hist. (2) II. 1848, p. 286; and Adams and White, Samarang Crust. p. 49, pl. xi. fig. 4.

*Chlorodius cytherea*, Dana, Proc. Ac. Nat. Sci. Phila. 1852, p. 79, and U. S. Expl. Exp. Crust. pt. I. p. 213, pl. xii. figs. 2a-c: Stimpson, Proc. Ac. Nat. Sci. Phila. 1858, p. 33.

*Chlorodius nebulosus*, Dana, Proc. Ac. Nat. Sci. Phila. 1852, p. 80, and U. S. Expl. Exp. Crust. pt. I. p. 214, pl. xii. fig. 3.

*Chlorodius depressus*, Heller, Abh. zool.-bot. Ges. Wien, 1861, p. 11; and SB. Ak. Wien, XLIII. 1861, p. 338: Hilgendorf in v. d. Decken's Reisen Ost-Afr. III. i. p. 74.

Carapace hexagonal, depressed: gastric region delimited by faint grooves and subdivided into from 3 to 5 indistinct areolæ by still fainter grooves; anterior part of branchio-hepatic region, just inside the antero-lateral margin, with one or two low broad transverse wrinkles: the surface of the carapace quite smooth (non-granular).

First lobe of the antero-lateral border small, almost confluent with the rounded external orbital angle; last two lobes usually ending in incurved spine-like points.

Chelipeds, in both sexes, twice or more the length of the carapace, usually quite smooth to the naked eye; a tubercle or spine on the anterior edge, and a little crenulation (not always present) on the posterior edge of the arm; inner angle of wrist strongly pronounced; fingers stout, a good deal arched, markedly spoon-like at tip.

Legs with a good deal of hair, and long fine bristles interspersed, on the dorsal aspect of the last three joints.

Colours in spirit: yellowish brown to bluish or purplish brown, sometimes mottled; fingers black.

In the Indian Museum are 64 specimens, from the Andamans, Nicobars, Mergui, and Mekrán coast, (besides 52 from other parts of the Indo-Pacific).

#### 85. *Chlorodius lævissimus*, Dana.

*Chlorodius lævissimus*, Dana, Proc. Ac. Nat. Sci. Phila. 1852, p. 80, and U. S. Expl. Exp. Crust. pt. 1. p. 215, pl. xii. figs. 4a-g.

Carapace hexagonal, a little tumid, its surface perfectly smooth without trace of regions or areolæ.

First lobe of antero-lateral border almost obsolete, last tooth very small, the third tooth much the largest and most prominent.

Anterior edge of arm without a spine.

Last three joints of the legs with a few scattered long fine bristles—no hair.

Fingers very strongly arched, a character which—as Dana has noticed—at once distinguishes this little species from the young of *Chlorodius niger*, which it otherwise closely resembles.

Colours in spirit, white, fingers brown.

In the Indian Museum are 9 specimens, from the Andamans and Ceylon, (and 1 from Mauritius).

#### PHYMODIUS, A. Milne Edwards.

*Chlorodius*, (part) Milne Edwards, Hist. Nat. Crust. I. 399: Dana, U. S. Expl. Exp. Crust. pt. I. p. 204.

*Phymodius*, A. Milne Edwards, Ann. Sci. Nat., Zool. (4) XX. 1863, p. 233; and Nouv. Archiv. du Mus. IX. 1873, p. 217; and Miss. Sci. Mex. Crust. p. 266.

*Phymodius*, Miers, Challenger Brachyura, p. 139.

Carapace moderately flat, hexagonal, all the regions well delimited, and broken up into numerous convex areolæ which have a smooth bare surface.

Fronto-orbital border not quite two-thirds the greatest breadth of the carapace. Front distinctly bilobed, with the outer angle of each lobe forming a distinct little lobule; its breadth is about a third the greatest breadth of the carapace. Orbital margin with 2 grooves above and one at the outer angle: eyes on short thick stalks.

Antero-lateral borders cut into four lobes or teeth: postero-lateral border nearly equal in length to the antero-lateral.

Basal antennal joint large, extending outwards and upwards into the gap between the front and the orbit; the flagellum situated in the orbital hiatus.

Anterior edge of merus of external maxillipeds almost transverse.

Chelipeds unequal, twice or more the length of the carapace, about half the arm projecting beyond the edge of the carapace: fingers large, strongly arched, broadened and deeply hollowed at tip.

Legs with the meropodite carpopodite and propodite sharply spinous along their upper border.

Abdomen of the male five-jointed.

*Phymodius* is distinguished from *Chlorodius* by the extensive and distinct areolation of the carapace, by the narrower front, and by the spiny armature of the dorsal border of the legs.

*Key to the Indian species of Phymodius.*

- I. Lobules of carapace smooth but dull; chelipeds rough with nodules or tubercles; legs with scattered hairs that do not hide the spines:—
  - i. Sculpture of carapace sharp cut; chelipeds with postule-like tubercles extending as far as fingers. *P. ungulatus.*
  - ii. Sculpture of carapace worn; chelipeds with irregular nodules that do not usually reach more than halfway along the hand . . . . . *P. monticulosus.*
- II. Lobules of carapace smooth and polished, as also are the chelipeds; legs with a stiff fringe of hair along the anterior border concealing the spines there . . . . . *P. sculptus.*

86. *Phymodius ungulatus* (Edw.) A. M. Edw.

*Chlorodius ungulatus*, Milne Edwards, Hist. Nat. Crust. I. 400, pl. xvi. figs. 6–8: Dana, U. S. Expl. Exp. Crust. pt. I. p. 205, pl. xi. figs. 8a–b: Hess, Archiv. für Naturges. XXXI. 1865, pt. i. pp. 135, 171: Streets, Bull. U. S. Nat. Mus. VII. 1877, p. 105.

*Phymodius ungulatus*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 218: Hilgendorf, MB. Ak. Berl. 1878, p. 790: Kossmann, Reise roth. Meer. Crust. p. 34: Haswell, Cat. Austral. Crust. p. 59: Miers, Challenger Brachyura, p. 139: Cano, Boll. Soc. Nat. Napol. III. 1889, p. 201: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 362: Ortmann, Zool. Jahrb. Syst. VII. 1893–94, p. 464: de Man, Zool. Jahrb. Syst. VIII. 1894–95, p. 524.

? *Xantho de Haanii*, Krauss, Sudafr. Crust. p. 29, pl. i. fig. 2: Heller, SB. Ak. Wien, XLIII. 1861, p. 337, and Novara Crust. p. 19.

*Chlorodius areolatus*, Adams and White, Samarang Crust. p. 41, pl. xi. fig. 3.

The regions and numerous sub-regions of the carapace are all convex and sharply defined by clean-cut furrows; their surface is smooth but dull, owing to close microscopic granulation.

Front bilobed, the outer angle in each lobe forming a distinct little lobule.

The four teeth of the antero-lateral border are sharply conical.

Chelipeds unequal, but not greatly so, very finely granular; arm with the anterior border rather strongly serrated, and with numerous pustule-like tubercles along the posterior border; upper and outer surface of wrist, and upper as well as a small part of inner and a larger part of outer surface of hand, covered with well-spaced pustule-like tubercles, those on the outer surface of the hand being in longitudinal series; inner angle of wrist strongly pronounced, with bifid tip.

Legs with finely granular surface, sharply granular on the dorsal aspect, where there are some long scattered hairs: upper edge of meropodites with 1 row of spinules, upper border of carpopodites with 3 rows, of propodites with 2 rows.

Colours in spirit, yellowish brown, or greenish; fingers black.

In the Indian Museum are 12 specimens, from the Andamans and Ceylon, (as well as 19, from Mauritius and Samoa).

#### 87. *Phymodius monticulosus* (Dana), A. M. Edw.

*Chlorodius monticulosus*, Dana, Proc. Ac. Nat. Sci. Phila. 1852, p. 79; and U. S. Expl. Exp. Crust. pt. I. p. 206, pl. xi. figs. 9a-f: Stimpson, Proc. Ac. Nat. Sci. Phila. 1858, p. 34.

*Chlorodius obscurus*, Lucas in Jacquinot's Voyage Astrolabe, Zool. Vol. III. Crust. p. 26, pl. iii. fig. 4.

*Phymodius monticulosus*, A. Milne Edwards, Nouv. Archiv. du Mus. IV. 1868. p. 71 (name only): Richters in Möbius, Meeresf. Maurit. p. 148: Miers, Challenger Brachyura, p. 139: Muller, Verh. Ges. Basel, VIII. 1886, p. 474: Cano, Boll. Soc. Nat. Napoli, III. 1889, p. 201: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 363: de Man, Zool. Jahrb., Syst. VIII. 1894-95, p. 524: T. Whitelegge, Mem. Austral. Mus. III. 1897, p. 136.

*Phymodius obscurus*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 220: (?) de Man, Notes Leyden Mus. II. 1880, p. 174: Richters in Möbius, Meeresf. Maurit. p. 148.

Closely resembles *P. ungulatus*, but is at once distinguished by the more convex arch of the front and antero-lateral borders, by the greater dorsal convexity of the carapace, by the "worn" look of the sculpture of the carapace, and by the much less rough hands.

Carapace thick, and distinctly convex in its anterior two-thirds; the regions and subregions are all distinct and convex, but the depressions that separate them are broad and not sharp cut, and this gives the sculpture a worn or moulded appearance.

Front bilobed, the outer angle of each lobe well defined.

The four teeth of the antero-lateral margin are blunt and rounded the first two being very much worn.

Chelipeds unequal—more so than in *P. unguilatus*: arm with two or three coarse denticles on the anterior border, the posterior border being rugose; upper and outer surface of wrist nodular; a certain part of the upper, as well as of the inner and (more so) of the outer surfaces of the hand nodular, but except in very young specimens, the nodules do not extend beyond, and often not so far as, halfway along the hand, so that the greater part of the hand is often smooth.

Legs as in *P. unguilatus*, but the spinules are coarser and blunter.

Colours in spirit—dark chestnut brown, sometimes mottled with grey; fingers blackish brown.

In the Indian Museum is a single specimen from the Nicobars (in addition to 21 from Australia, the South Seas, and Mauritius).

#### 88. *Phymodius sculptus*, (A. Milne Edwards).

*Chlorodius sculptus*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 217, pl. viii. fig. 4: de Man, Notes Leyden Mus. III. 1881, p. 98; Archiv. für Naturges. LIII. 1887, i. p. 279; and Journ. Linn. Soc., Zool., XXII. 1887-88, p. 32: Ortman, Zool. Jahrb. Syst. VII. 1893-94, p. 466.

Regions of the carapace well defined and subdivided, by broad and deepish grooves, into smooth, polished, convex but flat-topped lobules: those of the branchio-hepatic regions are disposed transversely: the antero-lateral sub-regions of the gastric area are not longitudinally subdivided.

Front bilobed, the outer angles of each lobe distinct but not very prominent.

The antero-lateral border is cut into four smooth lobes and is rather shorter than the postero-lateral.

The chelipeds are unequal: the arm has several sharp teeth on the anterior border and several pearly tubercles on the distal end of the posterior border, and the inner angle of the wrist is salient; but the surface of the chelipeds is smooth and polished.

The most characteristic feature of the legs is the dense stiff fringe of long greenish-yellow bristles that clothes the anterior border of the last four joints, concealing the sharp spines with which these borders are armed.

Colours in spirit, body and legs green with brownish points, chelipeds brownish, fingers black.

In the Indian Museum are 10 specimens, from the Andamans, Mergui and Ceylon.



## CHLORODOPSIS A. Milne Edwards.

*Chlorodopsis*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 227.

? *Pilodius*, (part) Dana, U. S. Expl. Exp. Crust. pt. I. p. 217.

Carapace flat, more or less hexagonal, the regions well delimited and well areolated, the areolæ being granular or hairy, or both.

Fronto-orbital border about two-thirds the greatest breadth of the carapace. Front bilobed, the outer angle of each lobe usually well defined and forming a distinct little lobule; its breadth is about a third the greatest breadth of the carapace.

Antero-lateral border almost always cut into four teeth. Postero-lateral border commonly a little longer than the antero-lateral.

Orbital border with the three grooves or notches very distinct.

Basal antennal joint large, extending up between the front and the orbit, the outer angle being prolonged into the orbital hiatus.

Anterior edge of merus of external maxillipeds almost transverse.

Chelipeds either unequal or subequal, their length being generally under twice the length of the carapace; the arm short and not projecting very much beyond the carapace.

Fingers strong, arched, broadened and hollowed at tip, but not so hoof-like as *Chlorodius*.

Legs dorsally almost always hairy and spinous.

Abdomen of male 5-jointed.

*Chlorodopsis* is distinguished from *Chlorodius* and *Phymodius*, (1) by the prolongation into the orbital hiatus of the outer angle of the basal joint of the antenna, and (2) by the granular and hairy or furry carapace.

*Key to the Indian species of Chlorodopsis.*

- I. The entire carapace cut into strongly-convex, isolated areolæ, the surface of which is uniformly covered with pearly granules: the deep smooth grooves between the areolæ, and the spaces between the granules, covered with a dense, dark, extremely short fur ..... *C. areolata.*
- II. Only the anterior  $\frac{2}{3}$  to  $\frac{3}{4}$  of the carapace areolated: three or four of the lobules just inside the antero-lateral border either bear spines or are themselves spine-like:—
  - i. Sculpture of carapace and legs almost concealed by bristles and long hairs:—
    1. Posterior fourth of carapace slightly concave; chelipeds rather slender, little unequal, the black colouration of the thumb hardly involves the hand at all:—
      - a. Antero-lateral margin armed with four large spines (not including the orbital angle) ..... *C. pilumnoides.*

- b. Antero-lateral margin divided into four blunt spinuliferous lobes ..... *C. nigrocrinita.*
2. Posterior fourth of carapace flat; the antero-lateral margin consists of four lobes each capped by several spinules: chelipeds markedly unequal, the black colouration of the thumb involves the greater part of the lower surface of the hand ... ..... *C. melanochira.*
- ii. Carapace with a few scattered hairs which do not in the least conceal its sculpture. The groove that cuts off the fronto-orbital margin from the rest of the carapace is very distinct:—
1. All four spines of the antero-lateral margin equal, the 2nd and 3rd commonly with an accessory spinule near the tip..... *C. wood-masoni.*
2. First spine of the antero-lateral margin small or obsolescent; last three spines large, claw-like ..... *C. spinipes.*

89. *Chlorodopsis areolata*, (Edw.) A. M. Edw.

*Chlorodius areolatus*, Milne Edwards, Hist. Nat. Crust. I. 400: Hess, Archiv. für Naturges. XXXI. 1865, pp. 135, 171.

*Chlorodius perlatus*, Macleay, Ill. Zool. S. Afr., Annulosa, p. 59: Krauss, Sudaf. Crust. p. 31.

*Chlorodopsis areolata*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 231, pl. viii. fig. 8: Hilgendorf, MB. Ak. Berl. 1878, p. 790: Richters in Möbius. Meeresf. Maurit. p. 148: Haswell, Cat. Austral. Crust. p. 54: Miers, Zool. H. M. S. Alert, pp. 517, 532: F. Muller. Verh. Ges. Basel, VIII. 1886, p. 474: de Man, Notes Leyden Mus. XII. 1890, p. 54: Ortman, Zool. Jahrb. VII. 1893-94, p. 470.

Carapace flat, but thick, as completely lobulated as any *Actæa*; the lobules strongly convex, isolated by broad deep smooth channels, their convexities as closely as possible covered with pearly granules, the dividing channels lined by an extremely short dense dark fur, which also extends between but does not cover the granules of the lobules.

The front is deeply and broadly cut into two granular lobes, the outer angle of each of which forms a separate lobule. The three fissures of the orbital margin are so deep as to give a lobed appearance.

The antero-lateral border is divided by broad notches into four rounded granular lobes.

Chelipeds unequal, the longer one about twice the length of the carapace; the upper part of the outer surface of the arm, the nodular or wrinkled surface of the wrist, and the upper and outer surface of the hand are all closely covered with pearly granules, which are largest on the hand: fingers strongly arched, smooth except for some grooving and granulation at base of dactylus.

The exposed surface of the legs is as closely as possible covered with a dense spongy fur from which the tops of numerous conical or subspinous granules peep out: the dorsal edge of the legs is also clothed with a thick shaggy fringe of hair, as also the ventrad edge of the last two joints.

Colours in spirit yellowish brown to blackish brown; fingers black, the colouration extending along the lower border and on to both surfaces of the hand.

In the Indian Museum are 19 specimens, from the Andamans, Nicobars and Ceylon (in addition to 12 specimens from the South Seas and Mauritius).

#### 90. *Chlorodopsis pilumnoides*, (White).

*Chlorodius pilumnoides*, White, P. Z. S. 1847, p. 226; Ann. Mag. Nat. Hist. (2) II. 1848, p. 286; Adams and White, Samarang Crust. p. 41, pl. ix. fig. 3.

? ? *Pilodius pilumnoides*, Dana, U. S. Expl. Exp. Crust. pt. I. p. 221, pl. xii. fig. 10a-c.

*Chlorodopsis pilumnoides*, de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 34, Archiv. für Naturges. LIII. 1887, i. p. 281; Cano, Boll. Soc. Nat. Napol. III. 1889, p. 204; Ortmann, Zool. Jahrb. VII. 1893-94, p. 470.

Carapace, chelipeds and legs granular, beneath a copious covering of short black bristles among which are scattered numerous long white club-shaped hairs.

Carapace flat, its regions, in the anterior two-thirds, plainly marked and subdivided by broadish shallow furrows, but not convex; its posterior third flat, or even a little concave, between two raised transverse beaded lines.

Front cut rather deeply into two granular or denticulate lobes, the outer angle of each of which forms a little lobule. The three fissures of the granular orbital margin are distinct.

On the antero-lateral margin are four red-tipped claw-like spines not including the orbital angle, the middle two, at least, of which have a pair of spinelets at base: on the carapace just inside either antero-lateral margin is a scattered group of 5 or 6 similar, but rather smaller, spines.

Chelipeds subequal, rather slender, not longer than the legs (less than twice the length of the carapace); both edges of the upper surface of the arm spinulate; numerous spines on the wrist, the one (or two) at the inner angle the largest; rows of spines along upper surface, rows of sharp granules along lower part of outer surface, of hand; fingers strongly fluted, the ridges being sharply and elegantly serrate or spinate.

In the legs, all the edges of the meropodites are more or less spinate and the carpopodites and propodites are dorsally more or less spinulate.

Colours in spirit: yellowish, or mottled green; legs yellowish with purplish-brown cross-bands, or light green with dark green cross-bands; fingers black, the colouration not extending along the hand.

In the Indian Museum are 7 specimens from the Andamans and 1 from Mergui.

91. ? *Chlorodopsis nigrocrinita*, (Stimpson).

? *Pilodius nigrocrinitus*, Stimpson, Proc. Acad. Nat. Sci. Philad. 1858, p. 34.

Differs from *C. pilumnoides* in having the antero-lateral margin cut into 4 blunt lobes which when denuded and examined under a lens are spinuliferous: only the distal end of the upper edge of the arm is spinulate.

Four specimens from the Andamans are in the Indian Museum.

It is at once distinguished from *C. melanochira*, to which it also bears a strong resemblance, by the altogether different form of the chelipeds and fingers. The chelipeds, like those of *C. pilumnoides*, are slender and of equal size, and the black colouration of the fingers does not extend on to the hand.

92. *Chlorodopsis melanochira*, A. M. Edw.

*Chlorodopsis melanochira*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 228, pl. viii. fig. 5: Haswell, Cat. Austral. Crust. p. 55: de Man, Archiv. für Naturges. LIII. 1887. i. p. 281, and in Weber's Zool. Ergebn. Niederl. Ost-Ind. II. 1892, p. 278; and Zool. Jahrb. Syst. VIII. 1894-95, p. 520: Ortmann, Zool. Jahrb. Syst. VII. 1893-94, p. 471.

Carapace, chelipeds and legs covered with short black bristles and long yellow hairs, the yellow hairs being sparse on the carapace but exceedingly long and numerous on the legs, and the bristles being embedded each in a curious little white ball of felt.

On the denuded carapace the regions are all well defined and well areolated by well-cut smooth grooves, the convexities of the areolæ being granular: the posterior third or fourth of the carapace forms a flat granular surface.

Front cut into two elegantly denticulated lobes, the outer angle of each of which forms an independent lobule. The three fissures of the finely denticulate orbital margin are distinct.

The antero-lateral margin is divided into four lobes, each of which is crowned with several spinules: two or three of the lobules of the carapace just inside either antero-lateral margin are capped with similar spinules.

The chelipeds are markedly unequal, the larger one being less than twice the length of the carapace. The anterior and posterior edges of the arm are granular; the wrist has the upper and outer surfaces studded with granules and conical spine-like tubercles; similar tubercles and pearly granules stud the upper and more or less of the outer surface of the hand; the finger has a few spinule-like tubercles at base.

The legs have the upper border of the meropodite, carpus, and propodite denticulate.

Colours in spirit; brownish yellow or mottled green, the mottling on the legs forming indistinct cross-bands; fingers black, the colouration involving the greater part of the lower border and both surfaces of the lower outer corner of the hand.

In the Indian Museum are 35 specimens from the Andamans.

This species is at once distinguished from *C. pilumnoides*, (1) by the smaller size, (2) by the better defined areolation of the carapace, (3) by the cap of spinelets—instead of a large claw-like spine—on each of the 4 lobes of the antero-lateral margin, (4) by the marked inequality of the chelipeds, and (5) by the black colouration of the thumb extending far back along the hand.

### 93. *Chlorodopsis spinipes* (Heller) A. M. Edw.

*Pilodius spinipes*, Heller, Abh. zool.-bot. Ges. Wien, 1861, p. 11, and SB. Ak. Wien, XLIII. 1861, i. p. 340, pl. ii. fig. 22.

*Chlorodopsis spinipes*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 230, pl. viii. fig. 6: de Man, Notes Leyden Mus. III. 1881, p. 98; Archiv. für Naturges. LIII. 1887, i. p. 282; and in Weber's Zool. Ergebn. Niederl. Ost-Ind. II. 1892, p. 278; J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 361; Ortmann, Zool. Jahrb. VII. 1893-94, p. 471.

Carapace and chelipeds with a few scattered hairs, legs with numerous long stiff brown and yellow hairs that a good deal conceal the sculpture.

The regions and subregions of the carapace in its anterior  $\frac{3}{4}$  are most remarkably well defined by broad smooth deep-cut grooves, and are coarsely and unevenly granular.

The front is cut into two lobes which have their free edge entire or slightly crenulate, and their outer angle isolated and spine-like. The orbital margin is sharp-cut and almost smooth: the 3 fissures are distinct.

The antero-lateral margin is cut into four teeth, of which the first is always small and often obsolescent, while the other three are large, procurved and claw-like. The three or four lobules of the carapace just inside and parallel with the antero-lateral border have the form of salient conical tubercles.

The chelipeds are unequal, the larger one being not quite twice the length of the carapace: the arm has 2 or 3 spines at the distal end of the anterior and posterior borders; the upper and outer surfaces of the wrist and hand are covered with sharp spine-like tubercles which become blunt and pearl-like in the lower part of the hand, and one or two of the spines at the inner angle of the wrist are enlarged; fingers with some sharp tubercles at base.

Legs with numerous long sharp spines (which are a good deal concealed by long stiff hairs) along the upper border,—a single series on the meropodites, 2 or 3 series on the carpopodites and propodites.

Colours in spirit: yellowish or greenish brown, somewhat mottled on the carapace and somewhat banded on the legs; fingers black, the colouration not extending to the hand.

In the Indian Museum are 20 specimens, from the Andamans and Mergui.

This species is suspiciously like the *Pilodius pugil* of Dana.

#### 94. *Chlo rodopsis wood-masoni*, n. sp.

Carapace with a few rather long scattered hairs, legs with similar but more numerous hairs, not in any way concealing the sculpture, chelipeds almost free from hairs.

The carapace is thick, and has the regions and subregions well defined, in its anterior  $\frac{3}{4}$ , by broad smooth grooves, and coarsely and unevenly granular.

The front is cut into two sharply denticulate lobes, the outer angle of each of which is very distinctly isolated and spine-like. The orbital margin is denticulate and has the three fissures distinct.

The antero-lateral margin has four large procurved spines, some of which (almost constantly the second one) may have an accessory spinule near the tip. Three or four of the lobules just inside either antero-lateral margin bear each a somewhat similar spine.

The outer angle of the basal antennal joint is prolonged into the orbital hiatus.

The chelipeds are unequal, the larger one being not quite twice the length of the carapace. The arm has one or two spine-like teeth at the distal end of both the anterior and the posterior border; the wrist is studded with spine-like tubercles and has a pair of strongish spines at the inner angle; the hand has spine-like tubercles along the upper surface, and close-set pearly granules along the outer and lower surfaces; fingers with spine-like denticles at base only.

Meropodites of legs with the upper border spinulate; carpopodites

and propodites each with two or three rows of spinules and sharp granules.

Colours in spirit—yellowish or reddish brown; fingers black, the colouration stopping sharply at the base of the thumb.

Carapace 8 millim. long, 13 millim. broad.

In the Indian Museum are 19 specimens from the Andamans.

This species is very closely related to *C. melanodactylus*, A. M. Edw. (of which we have in the Museum specimens from Samoa) but differs in having (1) only a few scattered hairs on the carapace, (2) the front deeply bifid and elegantly denticulate, with the outer angle isolated and spine-like, (3) the sculpture of the carapace much sharper and bolder, (4) the pearly granules and spine-like tubercles of the chelipeds more numerous and close-set.

From *C. spinipes* it differs in having (1) the front sharply spinulate, (2) the first spine of the antero-lateral border almost as large and well spaced as the other three, the 2nd and 3rd spines moreover having almost always an accessory spinule near the tip, (3) the spines of the legs not so large and acicular and not so much concealed by hairs.

It may very possibly be the *Pilodius scabriculus* of Dana.

#### Sub-genus CYCLODIUS, Dana.

*Cyclodius*, Dana, Silliman's Amer. Journ. Sci. and Arts, (2) XII. 1851, p. 126; and U. S. Expl. Exp. Crust. pt. I. p. 222.

*Cyclodius* agrees in every particular with *Chlorodopsis*, excepting only that the carapace is longer and narrower, being, in fact, almost as much sub-circular as hexagonal.

In general form, as in the relations of the basal antennal joint, *Cyclodius* much resembles *Etisodes*, from which, however, the form and breadth of the front at once distinguishes *Cyclodius*.

#### 95. *Chlorodopsis (Cyclodius) ornata*, Dana.

*Cyclodius ornatus*, Dana, Proc. Acad. Nat. Sci. Philad. VI. 1852, p. 80; and U. S. Expl. Exp. Crust. pt. I. p. 223, pl. xii. figs. 11a-g.

Carapace flattish, about  $\frac{4}{5}$  as long as broad, almost as much sub-circular as hexagonal, its regions and subregions delimited by well cut grooves, the subregions being numerous and having a microscopically granular surface.

Front a little more than half the greatest breadth of the carapace, bilobed, the outer angle of each lobe well pronounced. Orbital margin with two grooves above and one at the outer angle.

Antero-lateral margin cut into four teeth (exclusive of the orbital angle) the last three of which are procurved and claw-like.

Basal antennal joint prolonged into the orbital hiatus—and filling it—on the same extensive scale as in *Chlorodopsis areolata*.

Chelipeds very little unequal, not much longer and stouter than the legs, about  $1\frac{3}{4}$  times the length of the carapace: arm with several spinules along the posterior border and two large ones on the anterior border; wrist and hand with numerous sharp spine-like tubercles, which fall into longitudinal series on the outer surface of the hand; fingers with some coarse spinules at base, rather strongly arched, broadened and hollowed at tip.

Legs granular, somewhat furred, the upper border of the meropodites carpopodites and propodites spinuate.

The grooving of the under surface of the carapace, found in all the species of *Chlorodius*, *Chlorodopsis*, &c., is particularly elegant.

In the Indian Museum is a male from the Andamans (and one from Mauritius).

### Alliance III. *Cymoida*.

#### CYMO, De Haan.

*Cymo*, De Haan, Faun. Japon. Crust. p. 22.

*Cymo*, Dana, Amer. Journ. Sci. and Arts. (2) XII. 1851, p. 126; and U. S. Expl. Exp. Crust. pt. I. p. 224.

Carapace about as long as broad, subcircular, or less commonly elongate-pentagonal; not, or little, convex; depressed, with regions and subregions faintly or not at all shown.

Fronto-orbital border from about  $\frac{2}{3}$  to  $\frac{3}{4}$  the greatest breadth of the carapace in extent. Front from about  $\frac{1}{2}$  to about  $\frac{1}{3}$  this measure, horizontal, bilobed, with the outer angle of each lobe prominent and separated from the supra-orbital margin by a notch and groove. The grooves of the orbital margin are either indistinguishable or distinct. Eyes on short thick stalks.

The antennules fold obliquely. The basal joint of the antennæ has its outer angle produced into the orbital hiatus, and the flagellum, which is short, is situated between this process of the basal joint and the front.

The chelipeds are remarkably unequal in both sexes, the larger cheliped, in adults, being more than half again as long and more than twice as massive as the smaller: the fingers of the larger cheliped are short, thick, blunt-pointed (beak-like) and hollowed at tip; those of the smaller hand, though also hollowed-out, are long and slender.

The legs are invested and fringed with a thick shaggy fur that entirely conceals their sculpture: they are short and massive.



The abdomen of the male consists of five joints, the 3rd-5th somites being fused.

The species of this genus are at once recognized by the subcircular carapace, which even in the male leaves the first two and part of the third abdominal terga exposed in a dorsal view; and by the remarkable inequality and dissimilarity of the chelipeds.

*Key to the species of Cymo.*

- I. Carapace subcircular, depressed, but not quite flat:—
- i. Wrists and hands studded with sharpish granules only: front bilobed, the edge of each lobe denticulate:—
    1. Fingers white..... *C. andreossi.*
    2. Fingers black except at tip..... *C. melanodactylus*
  - ii. Wrists and hands with large granular warts as well as granules:—
    1. Front bilobed, the edge of each lobe concave and the angles in the form of granular tubercles, so that the front appears four-lobed..... *C. quadrilobatus.*
    - [2. Front not four-lobed..... *C. tuberculatus.*]
- II. Carapace more elongate-pentagonal than subcircular, perfectly flat..... *C. deplanatus.*

96. *Cymo andreossi*, (Audouin) De Haan.

*Pilumnus? andreossi*, Audouin on Savigny's Descr. de l'Égypte, pl. v. fig. 5, p. 86.

*Cymo andreossi*, De Haan, Faun. Japon. Crust. p. 22: Dana, U. S. Expl. Exp. Crust. pt. I. p. 225, pl. xiii. figs. 2 a-b: Stimpson, Proc. Ac. Nat. Sci. Phila. 1858, p. 34: Heller, SB. Ak. Wien, XLIII. 1861, p. 346, and Novara Crust. p. 20: A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 252: Kossmann, Reise roth. Meer. Crust. p. 35: Miers, Phil. Trans. Vol. 168, 1879, p. 487, and Zool. H. M. S. Alert. pp. 517, 532: de Man, Archiv. fur Naturges. LIII. 1887, i. p. 291: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 363: Ortmann, Zool. Jahrb. Syst. VII. 1893-94, p. 443.

Carapace almost circular, its greatest length being inappreciably less than its greatest breadth, closely covered with a spongy fur on removal of which can be seen (1) faint depressions demarcating the gastric and cardiac regions and incompletely separating the gastric region into three sub-regions, others subdividing the branchio-hepatic regions into faintly convex areolæ, and (2) a few granules on the anterior part of the gastric region (in a transverse line) and on some of the lobules of the branchio-hepatic regions.

Front rather more than  $\frac{2}{3}$  the greatest breadth of the carapace in extent, bilobed, separated from the dentiform supra-orbital angle by a

groove, its free edge irregularly denticulate. Orbital margin entire. Lateral borders of the carapace somewhat granular.

Chelipeds markedly unequal, covered with fur, but not so much as to entirely conceal their sculpture. The arm has both borders fringed with fur and the distal corner of the upper surface granular; the upper and outer surfaces of the wrist are studded with sharpish granules, as are the upper, outer and part of the inner surfaces of the hands and the basal half of the finger — those towards the upper part of the hand having a linear arrangement. The fingers of the larger cheliped are stout, truncated, blunt-pointed and strongly hollowed at tip; those of the smaller cheliped, though also hollowed, are thin, slender and pointed.

The legs are covered with a thick shaggy coat of fur, which is specially long and adherent along the borders. When this is removed the upper edge of the meropodites is finely granular, and the upper borders of the following joints are traversed by several rows of sharpish granules.

Colours in spirit, brownish yellow or fawn-colour, fingers white.

In the Indian Museum are 11 specimens, from Mekran coast, Ceylon, Andamans and Nicobars (besides 11 from other parts of the Indo-Pacific).

#### 97. *Cymo melanodactylus*, De Haan.

*Cymo melanodactylus*, De Haan, Faun. Japon. Crust. p. 22: Dana, U. S. Expl. Exp. Crust. pt. I. p. 225, pl. xiii, fig. 1: Stimpson, Proc. Acad. Nat. Sci. Philad. 1858, p. 34: A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 252: Ortmann, Zool. Jahrb. Syst. VII. 1893-94, p. 442.

*Cymo andreossi* var. *melanodactylus*, Miers, Zool. H. M. S. Alert, p. 533 de Man, Journ. Linn. Soc. Zool. XXII. 1887-88, p. 35.

Differs from *C. andreossi* in the following particulars:—

(1) the carapace is more lumpy; (2) the anterior half of the lateral borders shows more distinct indications of three lobules, some of which may even bear a spinelet; (3) the fingers are black, except at tip.

In the Indian Museum are 8 specimens, from the Andamans, Mergui and Ceylon, (besides 2 from other parts of the Indo-Pacific.)

#### 98. ? *Cymo deplanatus*, A. Milne Edwards.

? *Cymo deplanatus*, A. Milne Edwards, Journ. Mus. Godefr. I. 1873, p. 257.

This species, if I am correct in my identification, differs from *Cymo andreossi* only in the following particulars:—

The carapace is less subcircular and more elongate-pentagonal;

it is as flat as a coin and is either quite smooth or has only a transverse row of granules in the anterior part of the gastric region: the somewhat pentagonal outline is due to the antero-lateral borders being convergent from a distinct, though obtuse, angle of union with the postero-lateral.

99. *Cymo quadrilobatus*, Miers.

*Cymo quadrilobatus* Miers, Zool. H. M. S. Alert, p. 533.

General form as of *C. andreossi*.

The carapace is covered with a fine close down which does not, however, in the least conceal its sculpture.

On either side of the carapace just behind the front are two granular transverse elevations (= Dana's areolæ 2 F and 1 M): the branchio-hepatic regions are distinctly areolated, the areolæ having the form of elevated clusters of pearly granules.

The front is really bilobed, but as each lobe has a deeply concave edge and both angles surmounted by a granular tubercle, it appears four-lobed.

The three grooves near the outer angle of the (beaded or crenulate and somewhat tumid) orbital margin are very distinct. The anterior half of the lateral margin of the carapace is divided into three granular lobes.

The chelipeds have the same general form and proportions as in *C. andreossi*: they are more or less invested with a fine down, which does not conceal their sculpture: the upper surface of the arm is covered with pearly granules: the upper and outer surfaces of the wrist, and the upper, outer and much of the inner surfaces of the hands, are covered with pearly granules, many of which, on the wrist and in lines along the upper surface of the hand, unite to form large wart-like tubercles: the fingers of the larger cheliped are stout, truncated, blunt pointed and somewhat hollowed at tip; those of the smaller cheliped, though hollowed, are thin and pointed.

The legs are thickly covered with fur and long adherent silky hairs, beneath which the whole dorsal surface of the last four joints is granular.

Colours in spirit: light yellow, with either livid or rich chestnut brown mottled markings on the carapace: fingers of the larger hand whitish, usually with a black base, those of the smaller hand black with white tips; in both cases the distal half of the lower border of the hand is black.

Carapace of largest specimen in the Indian Museum collection 15.5 millim. long, 16 millim. broad.

In the Indian Museum are 5 specimens, from Palk Straits, 5-7 fms., and off Little Andaman 12 fms.

100. *Cymo tuberculatus*, Ortmann.

*Cymo tuberculatus*, Ortmann, Zool. Jahrb. Syst. VII. 1893-94, p. 443.

This species, from the Maldive Islands, resembles *C. quadrilobatus* in the characteristic sculpture of the chelipeds, and may perhaps be identical with Miers' species.

It is not represented in the Indian Museum.

Section II. *Hyperomerista*.

The efferent branchial channels are defined by a ridge on either side of the palate, the ridges extending right up to the epistomial edge.

Sub-family IV. MENIPPINÆ.

Carapace broad, transversely oval; front a fourth, or less than a fourth the greatest breadth of the carapace. The basal antennal joint does not nearly reach the front. The abdomen of the male has all 7 segments distinct and separate.

Alliance I. MENIPPIOIDA. Carapace convex, its antero-lateral borders longer than the postero-lateral: ridges of the endostome faint.

Alliance II. PSEUDOZIOIDA. Carapace flat, its antero-lateral borders shorter than the postero-lateral: ridges of the endostome strong and sharp.

Sub-family V. OZINÆ.

Carapace broad, transversely oval; front broad, about a third the greatest breadth of the carapace. The basal antennal joint is broadly in contact with the front. All 7 segments of male abdomen distinct and separate. The efferent branchial channels very distinct and circumscribed.

Alliance I. OZIOIDA. The orbital hiatus is open and is occupied by the antennary flagellum.

Alliance II. RUPPELLOIDA. The orbit is a completely closed cavity.

Sub-family VI. PILUMNINÆ.

Carapace moderately broad; front about a third the greatest breadth of the carapace: the antero-lateral borders of the carapace

are not longer than, and are often shorter than, the postero-lateral. The basal antennal joint does not touch, or only just touches, the front.

Alliance I. *PILUMNOIDA*. Carapace commonly densely tomentose, its regions commonly well defined and areolated.

Alliance II. *HETEROPANOPIOIDA*. Carapace smooth, its regions either not at all, or not very well defined.

#### Sub-family VII. *ERIPHIINÆ*.

Carapace sub-quadrilateral, the antero-lateral borders not forming an arch but meeting the postero-lateral borders at a very open and inconspicuous angle. Front very broad, half or more the greatest width of the carapace, and, with the orbits, occupying the whole anterior border of the carapace. Basal antennal joint not touching the front. Abdomen of the male either with all 7 segments distinct or with the 3rd, 4th and 5th fused.

Alliance I. *ERIPHIOIDA*. The gastric region, at least, is well defined: basal antennal joint short and thick: orbits deep: arms stout and short.

Alliance II. *TRAPEZIOIDA*. Carapace perfectly smooth, without trace of regions: basal antennal joint slender: orbits shallow, affording little concealment to the eyes: arms long or very long, projecting in large part or entirely beyond the carapace, in repose.

Alliance III. *DOMECIOIDA*. No trace of regions; orbits shallow; arms short; legs, chelipeds, and frontal and antero-lateral borders of carapace strongly spinate. Merus of external maxillipeds more than twice as broad as long.

Alliance IV. *MELIOIDA*. Carapace hexagonal, the regions either absent or fairly well defined; basal antennal joint slender; orbits shallow. The chelipeds are very much shorter and slenderer than the legs.

#### Subfamily IV. *MENIPPINÆ*.

Alliance I. *Menippioida*.

*Menippe*. *Myomenippe*.

*MENIPPE*, De Haan.

*Menippe*, De Haan, Faun. Japon. Crust. p. 21.

*Pseudocarcinus*, Milne Edwards, Hist. Nat. Crust. I. 407.

*Menippe*, A. Milne Edwards, Ann. Sci. Nat., Zool., (4) XX. 1863, p. 280; and Exp. Sci. Mex. Crust. p. 262.

Carapace broad, transversely oval, moderately convex fore and aft,

very slightly so from side to side; the regions, except the gastric, little defined.

Antero-lateral borders long, strongly arched, cut into four teeth; postero-lateral borders slightly shorter than antero-lateral, convergent; posterior border short.

Front narrow, less than a fifth the greatest breadth of the carapace, rather prominent, almost horizontal, cut into two prominent lobes, the outer angle of each of which forms a distinct tooth.

Orbit with the three grooves near the outer angle well marked: inner orbital angles—both upper and lower—well pronounced. Eyes on short thick stalks.

The side edges of the front are not turned down and the short basal antennal joint does not nearly reach the front, so that the cavities of the orbits and antennules are not properly separated: the next antennal joint just reaches the front, and the long antennary flagellum stands in the orbital hiatus. The antennules fold nearly transversely.

The anterior edge of the merus of the external maxillipeds is oblique and a little sinuous but not excised.

The ridges of the endostome, defining the expiratory channels, are complete, but low and faint.

Chelipeds massive, a little unequal in both sexes; fingers stout, pointed, not hollowed.

Abdomen of male singularly broad, all seven segments distinct.

#### 101. *Menippe rumphii*, Fabr., v. Martens.

*Cancer rumphii*, Fabr., Ent. Syst. Suppl. p. 336: Herbst, Krabben, III. i. 63, pl. xlix. fig. 2.

*Menippe rumphii*, v. Martens, Archiv. für Naturges. XXXVIII. 1872, p. 88: de Man, Journ. Linn. Soc., Zool., XXI. 1887-88, p. 36: Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 363.

*Pseudocarcinus bellangeri*, Milne Edwards, Hist. Nat. Crust. I. 409, pl. xiv *bis*, fig. 15.

*Menippe bellangeri*, Heller, Novara Crust. p. 15: Muller, Verh. Ges. Basel, VIII. 1886, p. 474.

Gastric region distinct and fairly distinctly subdivided into three lobes; between it and the front are four pimple-like tubercles standing in a square. Two low indistinct somewhat granular elevations, nearly parallel with the curve of the antero-lateral border, traverse either branchial region; the first, which is the more distinct, can generally be traced across the gastric region also. The surface of the carapace is finely pitted antero-laterally, but elsewhere is smooth.

The front, which is not quite a fifth the greatest breadth of the carapace, consists of two prominent round-pointed lobes, outside of

each of which is a prominent rounded tooth separated from the supra-orbital margin by a groove:

The antero-lateral border is fairly sharp and is divided into four broad lobes, of which the last two are distinctly, the first two indistinctly, acuminate.

Chelipeds massive, a little unequal, smooth with some fine and distant pitting: inner angle of wrist bluntly prominent; fingers stout, rather short.

Legs stout, smooth, except the upper border which is sometimes microscopically granular: upper border of carpopodites sparsely, both borders of propodites and dactyli more thickly, hairy.

Colours in spirit reddish or brownish yellow with sometimes a fine network of darker markings; fingers black.

In the Indian Museum are 100 specimens, from Penang, Tavoy, Mergui, Madras coast, Ceylon, Laccadives, Karáchi and Persian Gulf.

#### Subgenus MYOMENIPPE, Hilgendorf.

*Myomenippe*, Hilgendorf, MB. Ak. Berl. 1878, p. 795.

Closely resembles *Menippe* in all respects, but differs (1) in the orbit being a completely closed cavity, owing to the contact of its upper and lower inner angles; hence the long antennary flagellum is quite excluded from the orbit, and (2) in the front being rather broader (nearly a fourth the greatest breadth of the carapace) and six-lobulate.

#### 102. *Menippe* (*Myomenippe*) *granulosa*, A. M. Edw.

*Menippe granulosa*, A. Milne Edwards, Ann. Soc. Ent. Fr. (4) VII. 1867, p. 275.

*Myomenippe duplicidens*, Hilgendorf MB. Ak. Berl. 1878, p. 796, (*vide de Man.*)

*Myomenippe granulosa*, de Man, Journ. Linn. Soc. Zool., XXII. 1887-88, p. 40, pl. ii. fig. 1; and Zool. Jahrb., Syst., VIII. 1894-95, p. 525.

The gastric region is fairly well demarcated and subdivided into three areas, the two antero-lateral of which have the surface broken up into low granular convexities: the lateral regions of the carapace are also rugose, the wrinkles being granular and falling into two broken series almost parallel with the curve of the antero-lateral borders. Every margin of the carapace is granular, as is also—besides the rugosities already mentioned—but more finely, a good deal of the surface near the margins.

The antero-lateral border is thin and rather sharp and is cut into four teeth, the first three of which are broad and anteriorly acuminate, the last narrow and carinated.

The front, which is nearly a fourth the greatest breadth of the carapace, is prominent, is separated from the orbit by a deep notch, and is bilobed, each lobe being cut into three teeth. The inner lower angle of the orbit is of the same size and form and as prominent as the innermost (largest) lobule of the frontal lobes.

Chelipeds massive, a little unequal; upper and outer surfaces of wrist and upper (and sometimes in the case of the smaller cheliped the greater part of the outer) surface of hand granular; fingers stout and rather short: inner angle of wrist sharply prominent, somewhat upcurved, a finely beaded line passing from its summit, backwards, along the whole length of the wrist.

Legs stout, with a rough and furred or scurfy surface, the upper border of the last four joints and the lower border of the last two rather abundantly fringed with fine stiff hairs.

Colours in spirit light brown, or greenish brownish yellow; fingers black.

In the Indian Museum are 6 specimens, from Mergui, Arakan, Diamond I., Singapore.

#### Alliance II. *Pseudozoioida.*

##### PSEUDOZIUS, Dana.

*Pseudozius*, Dana, Silliman's Journal (2) XII. 1851, p. 127; Proc. Ac. Nat. Sci. Philad. 1852, p. 81; and U. S. Expl. Exp. Crust. pt. I. p. 232.

*Pseudozius*, Miers, Challenger Brachyura, p. 141.

Carapace broad, transversely oval, little convex or quite flat, the regions not demarcated.

Antero-lateral border arched, shorter than postero-lateral border, obscurely divided into four very shallow lobes.

Front rather broad, much more than a fourth the greatest breadth of the carapace, separated from the orbit by a notch, excised in the middle line and having the outer angles pronounced,—and so, obscurely four-partite.

Orbital margin entire, the upper and lower inner angles almost in contact. The antennules fold nearly transversely.

Basal antennal joint very short, the next joint reaches the front; the flagellum, which is hardly as long as the major diameter of the orbit, lodged in a notch between the front and the orbital wall, but quite outside the latter.

The crests of the endostome, defining the expiratory channels, are strong, and the anterior border of the merus of the external maxillipeds is notched to assist in forming a permanent expiratory orifice.



Chelipeds massive, unequal in both sexes, the fingers pointed, not hollowed.

Abdomen of the male with all 7 segments distinct.

103. *Pseudozius caystrus* (Ad. and White) Miers.

*Panopeus caystrus*, Adams and White, Samarang Crust. p. 42, pl. ix. fig. 2.

*Pseudozius planus*, Dana, Proc. Ac. Nat. Sci. Philad. 1852, p. 81; and U. S. Expl. Exp. Crust. pt. I. p. 233, pl. xiii, figs. 6a-h: Richters in Möbins, Meeresf. Maurit. p. 148.

*Pseudozius caystrus*, Miers, Challenger Brachyura, p. 142: Ortmann, Zool. Jahrb., Syst., VII, 1893-94, p. 434; and in Semon's Forschungsr. (Jena. Denk. VIII), Crust. p. 49: de Man, Zool. Jahrb., Syst., VIII, 1895, p. 525: Whitelegge, Mem. Austral. Mus. III, 1897, p. 136.

Carapace transversely oval, depressed, smooth, almost flat behind the deflexed finely granular fronto-orbital region: no distinct regional boundaries.

The antero-lateral border is fairly sharp and is obscurely divided into four shallow lobes, the first two of which are rounded and almost confluent.

Front between a third and a fourth the greatest breadth of the carapace, bluntly four-partite.

Orbits with the margins entire, eyes small.

The buccal cavern is distinctly narrower anteriorly than posteriorly.

Chelipeds unequal, very massive, quite smooth to the naked eye; two strongish tubercles at the inner angle of the wrist; fingers arched, pointed, in the adult male they meet only at tip.

Legs smooth, dactyli furred, a few fine scattered silky bristles on the propodite.

Colours in spirit brownish yellow, fingers darker.

In the Indian Museum are 63 specimens, mostly from the Andamans, but also from the Mekrán (Baluchistán) coast, the Laccadives, and Bombay or Aden. (Also 2 from Samoa and 1 from Bantam).

Subfamily V. OZIINÆ.

Alliance I. *Ozioida*.

Ozius.

Epixanthus.

OZIUS, Edw.

*Ozius*, Milne Edwards, Hist. Nat. Crust. I. 404.

*Ozius*, Dana, Silliman's Journ. (2) XII. 1851, p. 127; and U. S. Expl. Exp. Crust. pt. I. p. 229.

*Ozius*, A. Milne Edwards, Ann. Sci. Nat. Zool. (4) XX. 1863, p. 289; and Nouv. Archiv. du Mus. IX. 1873, p. 237; and Miss. Sci. Mex., Crust. p. 276.

Carapace broad, transversely oblate-oval, moderately convex fore and aft, slightly convex or nearly flat from side to side; the regions, except the gastric, little defined; the surface smooth, or granular, often rugose anteriorly.

Antero-lateral borders of good length, strongly arched, usually broadly crenate or lobulate: postero-lateral borders convergent, usually about as long as the antero-lateral.

Front rather broad (considerably more than a fourth the greatest breadth of the carapace) obliquely deflexed, cut into four lobules or teeth of about equal size, separated from the orbit by a notch.

Orbits deep, rather small, the grooves near the outer angle inconspicuous: eyes on short thick stalks. The antennules fold nearly transversely.

Basal antennal joint prolonged between the side of the front and the orbital plate; the flagellum, which is very small (about half the major diameter of the orbit in length), stands in the orbital hiatus.

The ridges of the endostome, defining the expiratory channels, are very strong, and the opposed margin of the merus of the external maxillipeds is notched, usually very deeply, so that a permanent expiratory orifice results.

Chelipeds massive, unequal in both sexes; the fingers of good length, pointed not hollowed. In the Indian species there is a very large tooth at the base of the dactylus of the larger hand.

The abdomen of the male consists of 7 segments.

#### *Key to the Indian species of Osius.*

- |     |   |                         |
|-----|---|-------------------------|
| I.  | Carapace more than $\frac{2}{3}$ as long as broad, scabrous, more or less studded—like the wrists and hands—with salient pearly tubercles ..... | <i>O. tuberculosus.</i> |
| II. | Carapace $\frac{2}{3}$ as long as broad, smooth to feel, no tubercles; surface of wrists and hands—all or part—reticulate rugulose .....        | <i>O. rugulosus.</i>    |

#### 104. *Osius rugulosus*, Stimpson.

*Osius rugulosus*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 34: Heller, Novara Crust. p. 22, pl. iii. fig. 1: A. Milne Edwards, Nouv. Archiv. du Mus. IV. 1868, p. 71, and IX. 1873, p. 240, pl. xi. fig. 3: Miers, P. Z. S. 1877, p. 135: Haswell, Cat. Austral. Crust. p. 63: Cano, Boll. Soc. Nat. Napol. III. 1889, p. 204: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 477, and in Semon's *Forschunger.* (Jena. Denk. VIII.) Crust. p. 53.

Carapace two-thirds as long as broad, its surface everywhere finely pitted but not rough, a good deal rugulose and finely eroded just inside the antero-lateral borders: gastric region fairly well defined and in-

completely subdivided into three areolæ: branchial regions traversed by two ridges, which run respectively from the 3rd and 4th lobes of the antero-lateral borders, obliquely upwards and inwards to the gastric region.

Front cut into 4 equidistant teeth. Antero-lateral border rather faintly divided into 5 lobes, of which the first two are broad and rounded and the last three are bluntly acuminate. Orbital margin slightly tumid, well marked off from carapace; faint traces of two grooves near the outer angle; the inner angle of the lower margin a little prominent.

The upper and outer surfaces of both wrists and of the smaller hand, and the upper surface of the larger hand are reticulate-rugulose.

Legs stout, the last three joints and part of the under surface of the meropodites of all are tomentose.

Efferent branchial foramen large, sub-quadrangular.

Colours in spirit, dark violet brown or dark bluish brown, fingers black.

In the Indian Museum are 5 specimens, from the Andamans and Arakan.

#### 105. *Ozius tuberculosus*, Edw.

*Ozius tuberculosus*, Milne Edwards, Hist. Nat. Crust. I. 405: Heller, Novara Crust. p. 23: A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 238, pl. xi. fig. 2: Muller, Verh. Ges. Basel VIII. 1886, p. 474: de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 45: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 364.

Carapace more than two-thirds as long as broad, studded (except sometimes in the central and posterior parts) with small sharp pearly tubercles; gastric region well defined and imperfectly divided into elongate areolæ; branchial regions crossed transversely by two crescentic furrows, which have a common starting-point at the fourth tooth of the antero-lateral margin; post-orbital furrow well defined.

Front sunk below the level of the orbits, cut into four equidistant scabrous teeth. Antero-lateral border granular, cut into five teeth (exclusive of the orbital angle), of which the last is tuberculiform and the first four are broad and anteriorly-acuminate.

The lower edge of the orbit is separated from the tumid arch of the upper edge by a small gap, and is deeply concave between the dentiform external and internal angles.

Basal antennal joint massive, sinuous, granular. Efferent branchial foramen large, subcircular.

Chelipeds and legs with rough harsh surfaces: the upper and outer surfaces of the wrists and hands are for the most part studded with

sharp pearly tubercles like those on the carapace: the inner angle of the wrist is somewhat produced and forms a double-crowned tubercle.

The whole animal has a harsh feel, due partly to the roughness of the surface and partly to the presence of very short, stubbly, scattered bristles.

Colours in spirit, light red or madder, fingers darker, dactyli of legs blackish.

In the Indian Museum are two specimens, from Mergui and the Nicobars.

#### EPIXANTHUS, Heller.

*Epixanthus*, Heller, SB. Ak. Wien, XLIII. 1861, i. p. 323.

*Epixanthus*, A. Milne Edwards, Ann. Sci. Nat., Zool., (4) XX. 1863, p. 290; and Nouv. Archiv. du Mus. IX. 1873, p. 240.

*Epixanthus*, de Man, Journ. Linn. Soc. Zool. XXII. 1887-88, p. 45.

Carapace very broad, transversely oval, either moderately convex or almost flat, the regions very obscurely marked.

Antero-lateral borders long, strongly arched, with a thin sharp edge, usually regularly fissured or dentate: postero-lateral borders strongly convergent.

Front broad (from one-fourth to nearly one-third the greatest breadth of the carapace), slightly deflexed, separated from the supra-orbital margin by a notch, cut into four teeth or lobes. Either a suture or a gap beneath outer angle of orbit.

Antennules folding transversely, inter-antennular septum broad. Basal antennal joint very broad and short, largely in contact with the front; flagellum very short (less than half the major diameter of the orbit), lodged in the orbital hiatus.

The ridges of the endostome, defining the expiratory canal, are very strong, but the anterior border of the merus of the external maxillipeds is either not at all or only very slightly notched.

Chelipeds massive, unequal in both sexes; fingers long, pointed, those of the smaller hand being remarkably long and slender.

Abdomen of the male with all 7 segments distinct.

#### *Key to the Indian species of Epixanthus.*

- I. Carapace nearly flat, nearly smooth; antero-lateral border divided by very short narrow fissures into four broad shallow lobes..... *E. frontalis.*
- II. Carapace convex, scabrous; antero-lateral border deeply cut into five sharp thin teeth..... *E. dentatus.*

106. *Epixanthus frontalis*, (Edw.) Heller.

*Ozius frontalis*, Milne Edwards, Hist. Nat. Crust. I, 406 : Krauss, Sudaf. Crust. p. 31 : Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 34 : Hilgendorf, in v. d. Decken's Reisen Ost-Afr. III, i, p. 75.

*Epixanthus frontalis*, Heller, Novara Crust. p. 20 : A. Milne Edwards, Nouv. Archiv. du Mus. IX, 1873, p. 241 : Kossmann, Reise roth. Meer., Crust. p. 36 : Richters, in Möbius, Meeresf. Maurit. p. 148, pl. xvi. fig. 16 : Lenz and Richters, Abh. senck. Ges. XII, 1881, p. 421 : Miers, Zool. H. M. S. Alert, pp. 517, 534 : F. Muller, Verh. Ges. Basel, VIII, 1886, p. 474 : de Man, Journ. Linn. Soc. Zool., XXII, 1887-88, p. 46 ; and Archiv. fur Naturges. LIII, 1887, i. p. 292 ; and Zool. Jahrb., Syst. 1894-95, p. 525 ; Cano, Boll. Soc. Nat. Napol. III, 1889, p. 205 ; J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 364 : Ortman, Zool. Jahrb., Syst., VII, 1893-94, p. 477.

*Epixanthus kotschii*, Heller, SB. Ak. Berl. XLIII, 1861, i. p. 325, pl. i. fig. 14 (*vide* Heller).

Carapace transversely oval, depressed, almost flat, its length a little over  $\frac{5}{9}$  its breadth, granular and finely and faintly rugulose just inside the frontal and antero-lateral borders, smooth elsewhere. The gastric region and its three subregions are faintly indicated, and a low fine sinuous ridge completely traverses each branchial region from the last tooth of the antero-lateral border.

The front, which is a good deal less than a third the greatest breadth of the carapace, and has a double edge, is cut into four low teeth. Below the outer angle of the orbit there is a suture, not a gap.

Antero-lateral border thin and sharp, divided by short, narrow notches into four very broad shallow lobes, of which only the last two are at all acuminate.

Chelipeds massive, remarkably unequal—in the adult male especially. They are practically smooth. The fingers of the larger hand of the adult male are strongly arched and meet only at tip.

Legs almost smooth ; the borders of the dactylus and of the distal half of the propodite, in all, are covered with a short stubbly fur.

Colours in spirit, dirty yellowish or greenish brown, fingers blackish.

In the Indian Museum are 60 specimens, from the Andamans, Mergui, Akyab, Orissa coast, Ceylon, Makran coast (besides 22 specimens from localities outside India).

107. *Epixanthus dentatus*, (White).

*Panopeus dentatus*, White, P. Z. S. 1847, p. 226 ; Ann. Mag. Nat. Hist. (2) II. 1848, p. 286 ; Adams and White 'Samarang' Crust. p. 41, pl. xi. fig. 1.

*Heteropanope dentatus*, Stimpson, Proc. Ac. Nat. Sci. Phila. 1858, p. 35 : A. Milne Edwards, Nouv. Archiv. du Mus. IV. 1868, p. 71.

*Epixanthus dentatus*, Miers, Ann. Mag. Nat. Hist. (5) V. 1880, p. 233 : de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 46 : Henderson, Trans. Linn. Soc., Zool.,

(2) V. 1893, p. 364: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 478; and in Semon's *Forschungsr.* (Jena. Denk. VIII.) Crust. p. 53.

*Epixanthus dilatatus*, de Man, Notes Leyden Mus. I. 1879, p. 58 (*vide de Man*).

*Panopæus acutidens*, Haswell, P. L. S., N. S. W., VI. 1881-82, p. 542; and Cat. Austral. Crust. p. 51, pl. i. fig. 2.

Carapace transversely oval, convex fore and aft, slightly so from side to side; its length about  $\frac{9}{15}$  its breadth; its surface granular and somewhat tuberculous anteriorly, the tubercles being almost squami-form and fringed with short stubbly hair. The gastric region and its three subregions are very faintly indicated: the branchial regions are traversed by a low, sinuous, finely granular ridge.

The front, which is somewhat less than a third the greatest breadth of the carapace, has a rather indistinctly double edge and is cut into four lobes. There is a distinct gap in the orbital margin just below the outer orbital angle.

The antero-lateral border is deeply cut into five very thin sharp-edged teeth.

The exposed surfaces of the arms wrists and hands are finely reticulate-rugulose (most strongly marked on the hands) the reticulating wrinkles being covered with a very short stubbly or scurfy tomentum. Similar reticulating lines and patches of the same stubbly or scurfy growth also closely cover the surfaces of the leg joints.

Colours in spirit, dull earthly brown or yellowish, the carapace and chelipeds commonly mottled or marbled.

In the Indian Museum are 5 specimens, from Mergui and the Andamans (besides 2 from the South Sea Is.).

#### Alliance II. *Ruppelloida.*

Euruppellia.

Baptozius.

#### Subgenus EURUPPELLIA.

*Ruppellia*, Milne Edwards, Hist. Nat. Crust. I. 420 (part).

*Ruppellia*, Dana, Silliman's Journal (2) XII. 1851, p. 128, and U. S. Expl. Exp. Crust. pt. I. p. 245.

*Ruppellia*, A. Milne Edwards, Ann. Sci. Nat., Zool., (4) XX. 1863, p. 291.

*Euruppellia*, Miers, Zool., H. M. S. Alert, p. 534.

Differs from *Ozius* only in the form of the orbits. The upper and lower inner angles of the orbit are in contact, so as to close the orbit and to completely exclude the antennary flagellum.

I do not think this character is of generic importance, and I agree with Kossmann that the type of this genus should be included with *Ozius*.

There is however one species, *Ruppellia vinosa*, Edw., that is entirely different from any of the species (with, perhaps, the exception of *Ruppellia lata*, A. M. E.) with which it has hitherto been supposed to be congeneric.

This species I have separated as the type of a new genus *Baptozius*.

If, however, the other species of H. Milne Edwards' genus *Ruppellia* are referred to *Ozius*, then the name *Euruppellia* must be retained, in a different sense, for *Ruppellia vinosa* Edw., and the name *Baptozius* must lapse.

#### 108. *Ozius (Euruppellia) tenax*, Ruppell.

*Cancer tenax*, Ruppell, 24 Krabben roth. Meer., p. 11, pl. iii. fig. 1, pl. vi. fig. 5.

*Endora tenax*, De Haan, Faun. Japon. Crust., p. 22.

*Ruppellia tenax*, Milne Edwards, Hist. Nat. Crust. I. 421: Kossmann, Reise roth. Meer., Crust., p. 40.

Carapace transversely oblate-oval, two-thirds as long as broad, rugulose and granular antero-laterally, smooth to the naked eye elsewhere. Gastric region well demarcated in its anterior two-thirds, and broken up into five incompletely separated but rather convex lobules: branchio-hepatic regions divided into two transverse somewhat convex areas, independent of the rugosities inside the antero-lateral margin.

Front sunk below the level of the orbits, cut into four equidistant rounded granular teeth. Supra-orbital margin tumid, well delimited from carapace, with two distinct grooves near the outer angle. Infra-orbital margin separated from the supra-orbital by a notch, deeply concave between the prominent dentiform internal and external angles.

Antero-lateral border granular, cut into five teeth, the first four of which are broad and anteriorly-acuminate, the fifth tuberculiform.

Chelipeds markedly unequal; upper and outer surfaces of wrist very finely granular, upper and more or less of outer surface of hand granular and studded with larger pustulous granules: inner angle of wrist bluntly bicuspid: fingers pointed, those of smaller hand long and rather slender, as in typical *Ozius*; those of larger hand stout, the movable finger with a huge tooth at base, as in Indian species of *Ozius*.

Legs stout, finely granular under a lens, but smooth to naked eye; the dactyli covered with velvet up to the claw.

Colours in spirit reddish yellow, the reddish tinge darkest on carapace.

In the Indian Museum is a fine specimen from the Mekrán (Baluchistán) coast.

109. *Ozius (Euruppellia) annulipes*, Edw.

*Ruppellia annulipes*, Milne Edwards, Hist. Nat. Crust. I. 422: Dana, U. S. Expl. Exp. Crust. pt. I. p. 246, pl. xiv. figs. 4a-c: Stimpson, Proc. Acad. Nat. Sci. Phila. 1858, p. 37: A. Milne Edwards, Nouv. Archiv. du Mus. IV. 1868, p. 71: Haswell, Cat. Austral. Crust. p. 73: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 479: Whitelegge, Mem. Austral. Mus. III. 1897, p. 137.

*Euruppellia annulipes*, Miers, Zool. H. M. S. Alert, pp. 517, 523: de Man, Archiv. fur Naturges. LIII. 1887, i. p. 293, pl. xi. fig. 4 (hand only).

Closely resembles *Ozius (Euruppellia) tenax*, but differs as follows:—(1) the front is cut into four broader, shallower and much less prominent teeth: (2) the five teeth of the antero-lateral border are much sharper, and the margin of the first three is sharp and crest-like: (3) the supra-orbital margin is, practically, entire, the grooves near the outer angle being hardly visible even with a lens: (4) the infra-orbital margin is separated from the supra-orbital only by a shallow groove, is not concave, and has its outer angle hardly prominent.

In the Indian Museum is a specimen from Muscat (besides one from Samoa).

## BAPTOZIUS, n. gen.

*Ruppellia* (part) Milne Edwards, Hist. Nat. Crust. I. 420.

Type *RUPPELLIA VINOSA*, Edw. (*Op. cit.* I. 422).

Carapace broad, transversely oval, moderately convex fore and aft, slightly so from side to side, with no indication of regions.

Front very broad, about two-fifths the greatest breadth of the carapace, obliquely deflexed, with a thin almost straight edge.

Antero-lateral border short, not two-thirds the length of the postero-lateral, thin, cut into four sharp-edged teeth.

Orbits large, with a sharp, prominent, entire edge: the upper and lower inner angles are in contact, so as to completely exclude the antennary flagellum.

Antennules folding nearly transversely, the inter-antennular septum very broad.

Basal antennal joint massive; the flagellum of good length (about three-quarters the major diameter of the large orbit), lodged beneath the front and quite outside the orbital wall.

The crests of the endostome that define the expiratory canals are very strong, and a permanent orifice is formed not, as in *Ozius*, by a notch in the anterior border of the merus of the external maxillipeds—for the anterior border of the merus of the external maxillipeds is



entire—but by a deep emargination of the prolonged foliaceous opercular process of the first maxillipeds.

Chelipeds fairly massive, unequal in both sexes; fingers of good length, pointed.

Abdomen of male with all seven segments distinct.

110. *Baptozius vinosus*, (Edw.)

*Ruppellia vinosa*, Milne Edwards, Hist. Nat. Crust. I. 422.

*Euruppellia vinosa*, de Man, in Weber's Zool. Ergebn. Niederl. Ost-Ind. II. 1892, p. 278, pl. i. fig. 1.

Carapace broad, transversely oval, with a shiny frosted surface due to extremely close fine granulation, the granules becoming vesiculous and plainly visible to the naked eye near the frontal, orbital, and lateral borders.

The orbits are marked off by a fine groove, a short shallow  $\Lambda$ -shaped groove bisects the front and ends on the anterior part of the gastric region, and a fine sinuous crease passes from the interval between the third and fourth tooth of the antero-lateral margin inwards towards the gastric region; otherwise the surface of the carapace is unbroken.

Front nearly two-fifths the greatest breadth of the carapace, almost straight, with a fine double edge, the upper rim of which runs on to the orbit while the lower turns obliquely downwards to rest on the basal antennal joint,—both rims finely beaded.

The antero-lateral borders are cut into four thin sharp-edged teeth, the first three of which are somewhat angular, while the last is elegantly procurved: the edges of all are finely beaded.

The orbits are large and almost subtubular: the finely-beaded edge is entire, and the inner angle of the lower border is bluntly prominent: quite inside the orbit, where the cornea comes into contact, is an elegant fringe of eye-lashes.

The upper and outer surfaces of the wrists and hands are finely frosted: the inner angle of the wrist has the form of a sharp spine.

The last three joints of the legs are more or less covered with a harsh tomentum, thickest along the upper surface.

Colours in spirit: carapace dark purple above, dark greenish below, legs greenish, chelipeds greenish daubed with red and purple, fingers red. In very old spirit specimens the carapace and chelipeds are of a rosy madder.

In the Indian Museum are 4 specimens from the Andamans and one from an unrecorded (Indian) locality.

## Sub-family VI. PILUMNINÆ.

Alliance I. *Pilumnoida.*

Pilumnus.

Actumnus.

## PILUMNUS, Leach.

*Pilumnus*, Leach, Trans. Linn. Soc. XI. 1815, p. 321; and Malac. Podophth. Brit.: Latreille, Encycl. Meth. X. p. 124: Desmarest, Consid. Gen. Crust. p. 111: De Haan, Faun. Japon. Crust. p. 19: Milne Edwards, Hist. Nat. Crust. I. 415: Dana, Silliman's Amer. Journ. Sci. and Arts, (2) XII. 1851, p. 127, and U. S. Expl. Exp. Crust. p. 229: Milne Edwards, Ann. Sci. Nat. Zool. (4) XX. 1863, p. 285: Kossmann, Reise roth. Meer. p. 37: Milne Edwards, Miss. Sci. Mex. Crust. p. 280: Miers, Challenger Brachyura, p. 145.

In the numerous species of this genus the carapace and legs are generally thickly covered with hair.

Carapace transversely oval or subquadrilateral, declivous anteriorly, flat posteriorly, not greatly broader than long; the regions, as a rule, but moderately plainly demarcated and areolated.

Antero-lateral borders not longer, but commonly shorter, than the postero-lateral, and cut into teeth which, very commonly, are spiniform.

The front is usually about a third the greatest breadth of the carapace, but is sometimes broader: it is cut into two lobes, the outer angle of each of which commonly forms an independent dentiform or spiniform lobule separated from the supra-orbital angle by a groove or notch.

The orbits generally have a gap or fissure just below the outer angle, and one or two gaps or notches in the upper border: the inner lower orbital angle is commonly sharp and prominent. The eyestalks are moderately long and slender.

The antennules fold transversely. The basal antennal joint is short, either not quite touching the front, or just touching it by its inner angle; the flagellum, which is planted in the orbital hiatus, is long, usually very much more than the major diameter of the orbit.

The ridges of the endostome, defining the expiratory channels, are usually plain but not very high: the anterior border of the merus of the external maxillipeds is almost transverse and is not notched.

The chelipeds are stout, the fingers coarse, short and pointed. Legs usually stout and of moderate length.

The abdomen of the male consists of seven separate segments.

*Key to the Indian species of Pilumnus.*

## 1. Abnormal species:—

Carapace and chelipeds quite smooth and devoid of hair *P. lævis*.

Carapace covered with symmetrically disposed, raised, curved or sinuated ridges ..... *P. labyrinthicus*.

2. Normal species in which the carapace (like the legs and the greater part of the chelipeds) is covered with a more or less thick coat of hair, and is without raised ridges:—

- I. Front about a third the greatest breadth of the carapace:—

- i. Carapace declivous anteriorly, flat posteriorly; the outer orbital angle is not a spine, though it may be sharp:—

1. Upper margin of orbit with two, very distinct, triangular gaps or notches:—

a. A subhepatic spine just below outer orbital angle..... *P. vespertilio.*

- b. No subhepatic spine:—

α. Free edge of front, and upper margin of orbit, finely denticulate: front very prominent ..... *P. longicornis.*

γ. Free edge of front, and upper orbital margin, smooth or nearly so: front not prominent ..... *P. andersoni.*

2. Upper margin of orbit with one or both of the two notches indistinct or absent:—

a. Regions and areolæ of carapace convex, uniformly granular, and separated by smooth, deepish, clean-cut grooves ..... *P. cærulescens.*

- b. Regions etc. of carapace faintly demarcated and not uniformly granular:—

α. Notches in the denticulated upper orbital margin faint but distinguishable ..... *P. sluiteri.*

γ. Only one notch in the smooth upper orbital margin, and that faint: legs long and slender ..... *P. cursor.*

- ii. Carapace uniformly convex, or globose; the outer orbital angle is a spine like those of the antero-lateral border:—

1. Regions of carapace fairly distinct: whole outer surface of larger hand covered with sharp prominent spine-like tubercles..... *P. dorsipes.*

2. Regions of carapace faint; lower part of outer surface of hand smooth ..... *P. hirsutus.*

- II. Front nearer half than a third the greatest breadth of the carapace, nearly straight, finely denticulated, emarginate in the middle line..... *P. dehaanii.*

111. *Pilumnus vespertilio*, Fabr.

*Cancer vespertilio*, Fabricius, Ent. Syst. II. 463, and Suppl. p. 338.

*Pilumnus vespertilio*, Desmarest, Consid. Gen. Crust. p. 112 : Latreille, Encyc. Meth. X. p. 125 : Milne Edwards, Hist. Nat. Crust. I. 418, and in Cuvier's Règne An., Crust. pl. xiv. fig. 3 : Dana, U. S. Expl. Exp. Crust. pt. I. p. 236 : Heller, SB. Ak. Wien, XLIII. 1861, p. 343 : A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 242 : Miers, Crust. New Zealand, p. 19 ; and Ann. Mag. Nat. Hist. (5) V. 1880, p. 234 ; and Zool. H. M. S. Alert, pp. 183, 219 : Tozzetti, Magenta Crust. p. 55, pl. iv. figs. 25, 27, 32 : Hilgendorf, MB. Ak. Berl. 1878, p. 793 : E. Nauck, Zeits. Wiss. Zool. XXXIV. 1880, p. 53 (*gastric teeth*) : Richters in Möbius Meeresf. Maurit. p. 148 : Haswell, Cat. Austral. Crust. p. 65 : Filhol, Crust. New Zealand, p. 374, pl. xlv. fig. 5 : de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 58 ; and Archiv. für Nat. LIII. 1887, i. p. 295 ; and in Weber's Zool. Ergebn. Niederl. Ost-Ind. II. 1892, p. 283 ; and Zool. Jahrb., Syst., VIII. 1894-95, p. 537 : Cano, Boll. Soc. Nat. Napol. II. 1889, p. 206 : A. O. Walker, Journ. Linn. Soc., Zool., XX. 1886-90, p. 110 : J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 365 : Ortmann, Zool. Jahrb., Syst., VII. 1893-94, pp. 436, 438, and in Semou's Forschungsr. (Jena. Denk. VIII) Crust. p. 49 : Zehntner, Rev. Suisse Zool. II. 1894, p. 154.

*Pilumnus ursulus*, Adams and White, Samarang Crust. p. 45, pl. ix. fig. 6 : Hess, Archiv. für Nat. XXXI. 1865, i. pp. 137, 171, pl. vi. fig. 2 : Kossmann, Reise roth. Meer., Crust. p. 39 : F. Muller, Verh. Ges. Basel, VIII. 1886, p. 475.

Carapace, legs and chelipeds (with the exception of the fingers and the lower corner and lower border of the hand, which are bare) entirely concealed by a thick, dark, shaggy coat of coarse, tufted and somewhat matted hair. The hairs are of two kinds, longer and shorter, the longer being most numerous on the legs and on the borders of the carapace. The following description (and the descriptions of all the species mentioned in this paper) applies to the denuded animal.

Carapace transversely oval, nearly  $\frac{3}{4}$  as long as broad, flat posteriorly, a good deal deflexed anteriorly, the regions fairly distinctly delimited and areolated, the surface studded with small well-separated clusters of granules, from which the hairs spring.

Front obliquely deflexed, about a third the greatest breadth of the carapace, cut into two lobes, each of which consists of a large prominent convex inner division and a small receding semi-independent, but not dentiform, outer angle, lying nearly in front of the inner upper angle of the orbit.

The orbital margins, like the edge of the front, are smooth or obscurely crenulate ; in the upper margin are two broad triangular gaps : the outer angle of the orbit is sharp but not spiniform, and immediately below it is a fissure or gap in the infra-orbital margin.

The antero-lateral border is a little shorter than the postero-lateral, and is cut into three spiniform teeth, besides which there is a sub-hepatic denticle behind and below the outer orbital angle.

The chelipeds are unequal: the inner angle of the wrist may be sharp, but is never spiniform: the upper and outer surfaces of the wrists, of the smaller hand, and of all but the lower border and lower outer corner of the larger hand (which is quite bare and usually quite smooth) are covered with clusters of granules, some of which, on the smaller hand—and sometimes also on the larger hand—are arranged in longitudinal series.

The carpopodites and propodites of all the legs, and the meropodites also of the last pair, have the anterior and dorsal aspects granular. The longest legs are not much more than half again as long as the carapace.

In the Indian Museum are 64 specimens, chiefly from the Andamans, but also from Mergui and Palk Straits; (besides 10 specimens from other parts of the Indo-Pacific).

*Pilumnus vespertilio*, var.

Differs from the above only in having (1) the fur stiff, fine, bristly, and golden-yellow in colour, and (2) the whole of the outer surface—but not the lower border—of the larger hand granular.

In the Indian Museum are 9 specimens from Karáchi and 1 from Tavoy.

112. *Pilumnus longicornis*, Hilgendorf.

*Pilumnus longicornis*, Hilgendorf, MB. Ak. Berl., 1878, p. 794, pl. i. figs. 8, 9.

Carapace covered with a fine and very short fur, amid which—especially anteriorly—are numerous long silky bristles. Legs and chelipeds—except the larger hand, the greater part of which is quite bare—covered with similar fur and fringed with similar bristles.

Carapace somewhat quadrilateral or hexagonal, about  $\frac{2}{3}$  as long as broad, anteriorly deflexed, posteriorly flat; the regions fairly distinctly defined and areolated, the surface granular near the frontal and antero-lateral margins, elsewhere smooth to the naked eye.

Front obliquely deflexed, about a third the greatest breadth of the carapace, deeply cut into two lobes, each of which consists of a prominent angularly-convex inner portion and an independent spiniform outer angle; the free edge finely and evenly denticulate.

Two triangular gaps in the finely denticulated upper orbital margin and a fissure in the denticulated lower margin, just below the outer angle, which is not dentiform or very conspicuous.

Antero-lateral margin a good deal shorter than the postero-lateral, cut into three longish procurved spiniform teeth the bases of which are granular. No denticle—at most only a slightly-enlarged granule—below the outer angle of the orbit.

Antennary flagellum considerably more than half the greatest length of the carapace, fringed with some long silky hairs.

Chelipeds very unequal; anterior border of ischium and arm spinulate or spinate, both the other borders of the arm spinulate or granular; upper and outer surfaces of wrist sharply granular, the inner angle of the wrist prolonged into a stout spine; the whole upper outer and lower surfaces of the smaller hand sharply granular, with several rows of enlarged spiniform granules, fingers of smaller hand fluted; the larger hand and fingers are smooth, except for a granular patch quite at the near end of the outer surface and extending a variable distance along the upper border of the hand, and for a small patch of granules at the base of the dactylus.

The upper border of the meropodites of the legs is usually sharply spinate.

Colours in spirit yellow, fingers dark brown.

In the Indian Museum are 21 specimens, from Mekrán, Karáchi, Bombay, Nicobars, and Malacca Strait.

#### 113. *Pilumnus andersoni*, de Man.

*Pilumnus andersoni*, de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 59, pl. iii. figs. 5, 6, and Zool. Jahrb. Syst., VIII. 1895, p. 552.

Closely resembles *P. longicornis* from which it differs in the following particulars:—

(1) the carapace appears broader owing to the front being less prominent:

(2) the free edge of the front and the upper margin of the orbit are nearly or quite smooth; the lobes of the front are much less prominent, the notch between them is not so wide and deep, and the outer angles are dentiform, not spiniform:

(3) the outer angle of the orbit is sharper:

(4) the granular patch at the base and along the upper border of larger hand is larger.

In the Indian Museum are 5 specimens, from Mergui, Ceylon, Karáchi (and 5 from Gaspar Strait).

#### 114. *Pilumnus shuiteri*, de Man.

*Pilumnus shuiteri*, de Man, in Weber's Zool. Ergebn. Niederl. Ost-Ind. II. 1892, p. 283, pl. i. fig. 2: Ortmann, Zool. Jahrb., Syst., VII. 1893-94; pp. 436, 438.

*Pilumnus forskalii*, de Man (*nec* Edw.), Archiv. für Naturges. LIII. 1887. i. p. 295, pl. xii. fig. 1.

Carapace, legs and chelipeds (except the fingers) covered with a

harsh coat of short bristles with longer bristles interspersed, the latter being most numerous on the legs.

Carapace about  $\frac{2}{3}$  as long as broad, deflexed anteriorly, nearly flat in the posterior two-thirds, the regions fairly distinctly delimited, the surface rather profusely studded with little pits, from which the tufts of bristles arise; some granules near the antero-lateral borders and on the front part of the gastric region.

Front cut into two lobes, each of which is again subdivided by a deep triangular gap into a large square-cut internal lobe and an acute triangular external lobule.

Orbital margin granular: there are two gaps in the upper margin, but the inner one is narrow and indistinct; there is also a small gap just below the outer angle of the orbit, which is not very prominent.

Antero-lateral margin not much shorter than the postero-lateral, cut into three somewhat granular spiniform teeth. No tooth below the outer angle of the orbit.

Antennary flagellum not quite a third the length of the carapace, not fringed with hairs, though there may be one or two at its base.

Chelipeds very unequal: upper and outer surfaces of both wrists and hands and bases of dactyli covered with granules or small pearly tubercles, which are larger and more numerous and more prominent on the hands than on the wrists; sometimes a small patch of granules on inner surface of hands: inner angle of wrists strongly pronounced and dentiform.

Legs stout, the longest pair are about two-thirds again as long as the carapace.

Colours in spirit: carapace yellow copiously overspread with brick-red, chelipeds and legs yellow blotched and sometimes banded with terracotta-red.

In the Indian Museum are 7 fine specimens from the Andamans (besides one from Samoa).

#### 115. ? *Pilumnus cursor*, A. Milne Edwards.

? *Pilumnus cursor*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 244, pl. ix. fig. 4: Haswell, Cat. Austral. Crust. p. 67: Miers, Zool. H. M. S. Alert, pp. 183, 223: de Man, Archiv. für Naturges. LIII. 1887, i. p. 299.

Carapace etc. covered with a short fur with long hairs interspersed, the latter most numerous on the legs.

Carapace subquadrilateral, flat in the posterior half or more, declivous anteriorly, the regions faintly marked, finely and sparsely granular.

Front nearly two-fifths the greatest breadth of the carapace, not

very prominent, divided into two lobes, each of which consists of a convex inner part and an independent though not very prominent external angle.

The upper orbital margin is little prominent and has only one notch and that indistinct: outer orbital angle not prominent.

Antero-lateral border very much shorter than the postero-lateral, cut into three sharp teeth: no subhepatic tooth.

Chelipeds unequal: inner angle of wrists sharply pronounced, upper and outer surfaces of hands granular.

Legs slender, the longest pair are more than twice the length of the carapace.

Colours in spirit, carapace reddish-yellow, legs yellow.

In the Indian Museum is a single specimen, from the Andamans.

I identify this species with *P. cursor* on account of the long slender legs, the subquadrilateral carapace, the very short antero-lateral borders, and the broad front.

#### 116. ? *Pilumnus cærulescens*, A. M. Edw.

? *Pilumnus cærulescens*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 242, pl. ix. fig. 3: L. Zehntner, Rev. Suisse Zool. II. 1894, p. 153.

Carapace etc. covered with short fur, with long hairs interspersed, about  $\frac{5}{7}$  as long as broad, subquadrilateral, convex in anterior half, flat posteriorly: the regions very distinctly defined by well cut grooves, the areolæ convex and studded with granules of good size.

Front a third the greatest breadth of the carapace, deflexed, cut into two lobes the outer angles of each of which form independent dentiform lobes.

The upper orbital margin shows very faint traces of two shallow notches: a small triangular gap below the sharp, but non-spiniform, outer orbital angle.

Antero-lateral borders a good deal shorter than the postero-lateral, cut into three sharp teeth, in addition to which there is a small denticle behind and below the outer orbital angle.

Chelipeds unequal; upper and outer surfaces of wrists and of both hands closely and sharply granular, fingers very short, inner angle of wrists dentiform.

Legs stout, the longest pair not much more than two-thirds again the length of the carapace.

Colours in spirit, dull blue with a brownish tinge in places, fingers blackish brown.

In the Indian Museum is a single specimen from the Andamans.

I judge this species to be *P. cærulescens* by the Xanthodes-like form and sculpture of the carapace mentioned by Milne Edwards.



117. ? *Pilumnus hirsutus*, Stimpson.

? *Pilumnus hirsutus*, Stimpson. Proc. Ac. Nat. Sci. Philad., 1858, p. 37: Miers, P. Z. S. 1879, pp. 20, 31: Haswell, Cat. Austral. Crust. p. 69: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, pp. 435, 437.

Carapace etc. covered with stiff hairs of two kinds—long and short, the former most numerous on the legs.

Carapace nearly  $\frac{3}{4}$  as long as broad, convex in both directions, smooth when denuded, the regions hardly marked.

Front about a third the greatest breadth of the carapace, deflexed, cut into two lobes much like those of *P. vespertilio* in shape.

Upper orbital margin smooth, with two very faint and shallow notches; lower margin denticulate, with a gap just below the outer angle. No subhepatic tooth.

Antero-lateral border much shorter than the postero-lateral, with 4 spiniform teeth, one of which is the orbital angle.

Antennary flagellum of moderate length, without hairs, except at base.

Chelipeds unequal; borders of arm finely granular or denticulate, wrists with the upper and outer surfaces rough and the inner angle sharply pronounced; lower part of outer surface of larger hand smooth, the rest of this surface—like that of the smaller hand—sharply granular, the granules becoming spiniform towards the upper border.

Legs rather slender, the longest pair about two-thirds again as long as the carapace.

Colours in spirit, yellow, fingers light brown.

In the Indian Museum are 11 specimens, from the Andamans, Mergui, and the Malacca Str.

118. ? *Pilumnus dorsipes*, Stimpson.

? *Pilumnus dorsipes*, Stimpson, Proc. Ac. Nat. Sci. Philad., 1858, p. 37.

Carapace *globose, extremely deep*, not very much broader than long, covered—like the chelipeds and legs—with soft, though stiff, hair, fairly well areolated, finely granular under a lens.

Front about a third the greatest breadth of the carapace, cut into two convex, rounded, finely denticulate lobes, of which the outer angles form dentiform lobules.

Upper orbital margin not prominent, the two notches are very faint and shallow (especially the inner one), but are recognizable: lower orbital margin with a deep narrow cleft just below the outer angle.

Antero-lateral margin cut into four denticulate spiniform teeth, one of which is the outer orbital angle. No subhepatic tooth.

Antennulary flagellum about a third the length of the carapace, not hairy, except at base.

Chelipeds unequal, both hands covered, on the outer surface and upper and lower borders, with prominent spiniform granules, which also extend some way along both fingers.

Legs rather short, the longest pair being about half again as long as the carapace.

Colours in spirit yellow.

The body is of such depth that the last pair of legs, even in the male, lie, in the normal inclination of the body vertically over the first pair.

In the Indian Museum is a single male from the Andamans.

#### 119. *Pilumnus de Haanii*, Miers.

*Pilumnus de Haanii*, Miers, P. Z. S. 1879, pp. 20, 32; and Challenger Brachyura p. 155, pl. xiv. fig. 1: A. O. Walker, Journ. Linn. Soc., Zool., XX. 1886-1890, p. 110.

Carapace covered with a very fine and short, but dense, fur: legs and chelipeds with a similar fur mixed with long fine hairs on outer surface of hands and on borders of legs.

Carapace transversely oval, not three-quarters as long as broad, the regions (when carapace is denuded) fairly well marked and areolate, granular towards the antero-lateral margins and near the front.

The front is nearer half than two-fifths the greatest breadth of the carapace, is nearly straight, not at all prominent, is finely denticulate, and emarginate in the middle line.

Orbital margin very finely denticulate, the upper border with two very inconspicuous notches, a fissure below the acute outer orbital angle.

Antero-lateral border a good deal shorter than the postero-lateral, cut into three shallow anteriorly-acuminate teeth.

Chelipeds unequal: the outer surface of the wrists with a few granules anteriorly and along the inner border: upper and outer surfaces of hands closely covered with acute spiniform tubercles which also extend far along the fingers.

Legs stout, unarmed.

Colours in spirit, golden yellow.

In the Indian Museum are 7 specimens from Palk Str. 28 specimens from off Ceylon, 26½ to 34 fms., only differ from the typical form in having the front more deeply emarginate in the middle line.

This species, but for the broader straighter front, and for the broader carapace, more nearly resembles an *Actumnus* than a *Pilumnus*.

120. *Pilumnus labyrinthicus*, Miers.

*Pilumnus labyrinthicus*, Miers, Zool. H. M. S. "Alert," pp. 183 and 224, pl. xxii., fig. C: and "Challenger" Brachyura, p. 161: A. O. Walker, Journ. Linn. Soc. Zool. XX, 1896-1890, p. 110; Henderson, Trans. Linn. Soc. Zool. (2), V, 1893, p. 365.

"In this curious form the surface of the carapace is everywhere covered with raised curved or sinuated ridges, which are separated by wide depressions; the body and legs are covered with a dense close brown pubescence; from most of the ridges and from the teeth of the antero-lateral margins of the carapace spring longer setæ, and the margins of the ambulatory legs are also fringed with longer hairs. The frontal lobes, which are scarcely separated as usual by a median notch, are rather broad, straight, and but little prominent; the antero-lateral margins are somewhat shorter than the postero-lateral, and are armed with three distinct teeth, that of the exterior orbital angle being obsolete. The orbital margin is somewhat thickened; the epistoma rather longer in proportion to its breadth than is usual. The basal antennal joint is short, scarcely attaining to the sub-frontal process, and not nearly reaching to the apex of the very prominent lobe at the inner suborbital angle. The chelipeds are rather small and (like the carapace) are densely pubescent, besides being clothed with longer hairs; the outer surface of the wrist or carpus is tuberculated beneath the hairy coat; the palm is clothed externally with long dense hairs; the upper margin of the palm bears three distinct tubercles; the fingers are slaty coloured, dentated on their inner margins and acute at their apices. The ambulatory legs are densely hairy and of moderate length."

Not in the Indian Museum collection.

121. *Pilumnus* (?) *lævis*, Dana.

*Pilumnus lævis*, Dana, Proc. Ac. Nat. Sci. Philad. 1852, p. 82, and U. S. Expl. Expd. Crust. pt. i, p. 238; de Man, Journ. Linn. Soc. Zool. XXII, 1887-1888, p. 66, pl. iv. figs. 1 and 2: and Zool. Jahrb. Syst. VIII. 1895, p. 553.

"Near *P. levimanus*, but broader. Carapace smooth and shining, not areolate, rather convex: front emarginate, antero-lateral margin three-toothed, the teeth minute and like spines, the posterior much the smallest, outer angle of orbit not raised into a tooth. Anterior feet very unequal, carpus smooth, not even faint tuberculate; larger hand wholly smooth, smaller sparsely hirsute, not at all tuberculate. Posterior eight feet slender, somewhat hirsute."

A single specimen from Mergui. It appears to me doubtful that this species belongs to the genus *Pilumnus*.

122. *Pilumnus seminudus*, Miers.

*Pilumnus seminudus*, Miers, Zool. H. M. S. "Alert" pp. 183 and 222, pl. xxi. fig. C: "Challenger" Brachyura, p. 161: de Man, Journ. Linn. Soc. Zool. XXII, 1887-1888, p. 65.

"This species resembles *P. semilanatus* in having the gastric, cardiac, and branchial regions of the carapace smooth and naked; but it may be at once distinguished by the following characters:—The carapace is broader in proportion to its length, and its anterior parts clothed with a close velvety pubescence, which also extends over the upper and outer surface of the wrist and palm of the chelipeds; the two posterior teeth of the antero-lateral margins are more distinctly spiniform, the basal antennal joint does not nearly reach to the sub-frontal process; the granulations of the wrist and palm are much more inconspicuous, those of the outer surface of the palm appear, through the pubescence, to be arranged in four distinct longitudinal series; the ambulatory legs are slenderer."

A single small specimen in the Indian Museum, from Mergui, has been referred by Dr. de Man to this species.

## ACTUMNUS, Dana.

*Actumnus*: Dana, Silliman's Amer. Journ. Sci. and Arts, (2) XII. 1851, p. 128; and Proc. Acad. Nat. Sci. Philad. VI. 1852, p. 82; and U. S. Expl. Exp. Crust. pt. i. p. 243: A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 284.

Carapace very little broader than long, convex, fairly well or very well areolated: the antero-lateral borders short, cut into teeth; the postero-lateral longer than the antero-lateral, concave.

Front from about a third to about two-fifths the greatest breadth of the carapace; cleft or notched in the middle line, or bilobed with the outer angles independent, usually separated from the supra-orbital angle by a notch or groove.

Orbits rather large, with one or two notches or fissures or suture-lines (which often, however, are indistinct) in the upper margin, and one (often, also, very indistinct) in the lower margin near the outer angle. The inner lower angle of the orbit is prominent, and often comes so near to the supra-orbital angle as to almost exclude the antennary flagellum from the actual orbital hiatus.

The basal antennal joint touches or nearly touches the front; the flagellum which is of moderate length (longer than the major diameter of the orbit) sometimes springs from the orbital hiatus, but is sometimes almost excluded from the hiatus.

The crests of the endostome, defining the expiratory channels, are

not very strong, and the anterior border of the merus of the external maxillipeds is not notched.

The chelipeds are stout, and are unequal in both sexes: the fingers, which are short and stout, are commonly defined as spoon-shaped at tip: they are not really so, but have the tips curved and blunt pointed.

The legs are stout and not very long.

The abdomen of the male consists of seven separate segments, and the first tergum is unusually long and narrow in all the typical species.

Most of the species of this genus, but not all, are densely tomentose: all, however, have hairy or tomentose legs.

*Key to the Indian species of Actumnus.*

I. Carapace tomentose:—

i. Carapace areolated: front separated from the supra-orbital angle by a notch; antero-lateral border cut into 3 teeth (exclusive of outer angle of orbit):—

1. Front normally bilobed: supra-orbital margin granular, with two distinct notches:—

a. Carapace moderately convex, rather faintly areolate; outer angles of front hardly independent ..... *A. tomentosus.*

b. Carapace strongly convex, strongly areolate; the outer angles of the front are small distinct little lobules:—

x. Lateral gastric areolæ semi-circular ..... *A. setifer.*

y. Lateral gastric areolæ U shaped ..... *A. verrucosus.*

2. Front broadly triangular, with a deep button-hole cleft (the hole at posterior end) in the middle line: supra-orbital margin thin sharp, with a single deep very narrow fissure..... *A. fissifrons.*

ii. Carapace not areolated; front not separated from the supra-orbital angle; antero-lateral border with 7 spinuliform granules (3 pairs) and an odd one anteriorly ..... *A. elegans.*

II. Carapace perfectly bare:—

i. Carapace not areolate, front broadly bilobed; legs almost bare ..... *A. nudus.*

ii. Carapace very distinctly areolate, front with two median lobes and two (external) lobules: legs tomentose:—

1. Surface of carapace (and of parts of chelipeds) formed of a mosaic of smooth flat polygonal granules in the closest contact ..... *A. tessellatus.*

2. Surface of carapace, etc. covered with sharp crystalline granules in the closest contact ... *A. arbutum.*

123. *Actumnus tomentosus*, Dana.

*Actumnus tomentosus*, Dana, Proc. Ac. Nat. Sci. Philad. 1852, p. 82; and U. S. Expl. Exp. Crust. pt. i. p. 243, pl. xiv. figs. 2a-c: A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 285, and IX. 1873, p. 194: ? Tozzetti, Magenta Crust. 3. 56, pl. iv. figs. 22, 24, 26, 29: Haswell, Cat. Austral. Crust. p. 73: Etheridge, Mem. Austral. Mus. 1889, pp. 34, 36.

Carapace subcircular, rather more than  $\frac{3}{4}$  as long as broad, moderately convex, covered with a very dense short smooth tomentum. Much the same tomentum covers the exposed surfaces of the legs and chelipeds (except the lower and distal part of the outer surfaces of the hands), and the legs are also fringed with long fine hairs.

The regions are fairly well delimited and areolated, the areolæ being moderately convex: on the undenuded carapace the areolæ are faint.

Front about two-fifths the greatest breadth of the carapace, cut into two finely denticulated lobes, the outer angles of each of which, though sharply separated from the supra-orbital margin, do not form distinct lobules.

Orbital margin finely denticulate, the lower more markedly so than the upper; in the upper margin are two broad notches, the outer the more distinct; in the lower margin, just below the outer angle, is a narrow fissure; outer orbital angle dentiform.

Antero-lateral borders about two-thirds the length of the concave postero-lateral, very regularly cut into 3 uniform teeth similar to the outer orbital angle.

Chelipeds unequal: arm smooth; inner angle of wrists sharp, their inner border finely beaded, a few scattered granules on their upper and outer surfaces; upper and outer surfaces of hands covered with pearly granules which become obsolescent or obsolete near the lower border of the larger hand; dactyli longitudinally grooved, beaded at base.

Denuded legs nearly smooth.

In the Indian Museum are 53 specimens, from the Andamans, the Orissa Coast up to 30 fms., Palk str. and Cheduba.

Our specimens completely agree with Dana's figure, and are easily distinguished from *A. setifer* by the less convex and less distinctly areolated carapace.

124. *Actumnus setifer*, (De Haan), A. M. Edw.

*Pilumnus setifer*, De Haan, Faun. Japon. Crust. p. 50, pl. iii. fig. 3 (*Xantho*).

*Actumnus setifer*, A. Milne Edwards, Nouv. Archiv. du Mus. I. 1865, p. 287, pl. xv. figs. 5-5b: Richters in Möbius' Meeresf. Maurit. p. 148: Miers, Zool.

H. M. S. Alert, pp. 183, 225, 517, 533 : de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 47, and Archiv. für Naturges. LIII. 1887, i. p. 262 : Walker, Journ. Linn. Soc., Zool. XX. 1886-90, p. 110 : Pocock, Ann. Mag. Nat. Hist. (6) V. 1890, p. 74 : Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 364 : Ortmann, Zool., Jahrb. Syst. VII. 1893-94. p. 474.

Closely resembles *A. tomentosus*, from which it is distinguished by the following characters :—

The carapace is subglobular: the regions are very distinctly delimited and areolated, the areolæ being strongly convex and often uniformly granular.

The outer angles of the front form distinct little lobules: the fissure in the lower orbital margin, just below the outer angle, is indistinct.

The granules on the wrist are more numerous.

The more convex carapace and the more numerous and more convex areolæ, at once distinguish this species.

In the Indian Museum are 32 specimens from the Andamans, Ceylon up to 34 fms., Persian Gulf, Pedro shoal, and Mergui (besides 13 from Hongkong and 1 from Samoa).

The Indian specimens, especially those from deep water, have the lobules of the carapace more convex than those from Hongkong.

## 125. *Actumnus verrucosus*, Hndrsn.

*Actumnus verrucosus*, Henderson, Trans. Linn. Soc. Zool. (2), V, 1893, p. 364.

“The carapace is very convex, covered with a short brown pubescence, and provided with a series of remarkable granulated lobes. The frontal margin is granulated and four-lobed, the rounded prominent submedian lobes separated by a narrow median fissure, the outer lobes of small size. The antero-lateral margin has four prominent, subequal, granulated or subspinose lobes, while the postero-lateral margin is smooth and deeply excavated; the upper orbital margin is granulated and has two well-marked fissures. The granulated lobes on the carapace are arranged as follows :—On the anterior gastric region, behind the front, two pairs, of which the posterior is much larger; on the posterior gastric region three lobules, one median and anterior, two posterior; on each protogastric or lateral gastric region a peculiar  $\Psi$ -shaped lobule; on the cardiac region two lobules which are slightly excavated in the centre; on the branchial region three lobules, anterior, postero-external (which is the largest of the three), and a postero-internal one placed external to and between the posterior gastric and cardiac lobules.”

“The right cheliped is slightly larger than the left in both sexes;

both are clothed with a short pubescence on the outer surface of the carpus and hand, except towards the base of the immobile finger. The carpus is sparingly tuberculate externally, with a sulcus running parallel to the articulation with the hand, and separated from the latter by a tuberculated strip: the outer surface of the hand is strongly tuberculate, the tubercles with more or less acute apices, rather closely crowded and without any definite arrangement. The fingers are short, with white and obtuse tips, and the immobile one is placed in a straight line with the lower border of the hand; the dactylus is tuberculated superiorly on its proximal half, and a prominent tooth is present on either finger. The ambulatory legs are simply pubescent. The abdomen is smooth and seven-jointed in both sexes. The external maxillipeds are smooth, with a faint impressed line in the middle of the proximal two-thirds of the ischium. The basal joint of the antennal peduncle is joined to the sub-frontal process, and the terminal joints lie in the orbital hiatus."

"The largest specimen (a male) has the carapace 18.5 mm. long and 25.3 mm. broad."

126. *Actumnus fissifrons*, n. sp.

Carapace and legs covered with a not very dense coat of hairs of two kinds—long and short—the long hairs most numerous on the legs; chelipeds with very little hair.

Carapace strongly convex in all directions,  $\frac{3}{4}$  as long as broad, the regions distinctly delimited and areolated by smooth shallow grooves, the areolæ being slightly convex and more and less granular.

Front not quite a third the greatest breadth of the carapace, deflexed, broadly triangular, the apex with a deep button-hole fissure (the hole at the posterior end), the outer angles separated from the supra-orbital angles by a deepish notch.

Supra-orbital margin thin, sharp, very prominent, deeply fissured near the middle: infra-orbital margin thin, concave, fissured just below the outer angle.

Antero-lateral margin a little shorter than the postero-lateral, cut into three sharp-edged anteriorly-acuminate teeth (exclusive of the outer orbital angle): postero-lateral margin deeply concave.

Chelipeds markedly unequal: upper and outer surfaces of wrists with a few granules, most numerous anteriorly; upper and outer surfaces of both hands—including a great part of the fingers—studded with granules, of which many are enlarged conical or pearl-like, and those along the upper border are spiniform.

Colours in spirit bright orange yellow.



Off Ceylon, 26½–34 fathoms. Four specimens.

The carapace of the largest specimen is 21 millim. long and 28 millim. broad.

127. *Actumnus tessellatus*, n. sp.

Legs tomentose and hairy, chelipeds inconspicuously tomentose in parts, carapace bare.

The entire dorsal surface of carapace, the upper and outer surfaces of the wrists and the upper surface of the hands, have the form of an elegant mosaic of smooth polygonal tile-like granules in the closest possible contact everywhere.

Carapace strongly convex,  $\frac{3}{4}$  as long as broad, regions well defined and subdivided by broad depressions, the areolæ strongly and somewhat angularly convex.

Front much less than a third the greatest breadth of the carapace; deeply cut into two prominent subfoliaceous median lobes, each of which is flanked externally by a small dentiform lobule.

Orbital margins smooth, not fissured, though there are narrow inconspicuous depressions where the notches exist in other species. The antennary flagellum springs from the orbital hiatus.

Antero-lateral margins thin, sharp, cut into 3 teeth (not including the orbital angle) the last 2 of which are subfoliaceous: postero-lateral margins a little longer than the antero-lateral, markedly concave.

Chelipeds little unequal: in addition to the mosaic ornamentation there are a few scattered pustulous granules on the wrist and upper surface of hand, and all the lower half of the outer surface of the hand is studded with pearl-like or bead-like granules, which are also found on the bases of the fingers.

The legs when denuded are smooth to the naked eye.

Colours in spirit: lavender grey, a good deal suffused with orange-pink, fingers cinnamon.

Carapace 15 millim, long, 20 millim. broad.

A male and a female from the Persian Gulf.

128. *Actumnus arbutum*, n. sp.

Legs with a somewhat scanty growth of hair not concealing their sculpture, chelipeds slightly hirsute in places, carapace bare.

The whole dorsal surface of carapace covered with sharp angular crystalline granules in the closest possible contact: much the same ornamentation is found on the upper and outer surfaces of the wrists and on the upper surface of the hands, the lower half of the outer surface of the hands being studded with pearly and bead-like granules.

Carapace  $\frac{3}{4}$  as long as broad, strongly convex, profusely deeply and symmetrically puckered-areolate.

Front much less than a third the greatest breadth of the carapace, shaped as in *A. tessellatus*, but the edges of the lobes and lobules are crenulate.

Orbits and relations of antennæ as in *A. tessellatus*, but the edges of the orbits are sharply crenulate.

Antero-lateral margin cut into three sharply crenulate granular teeth—not including the orbital angle: postero-lateral margin shorter than the antero-lateral, concave.

Chelipeds a little unequal: fingers granular in the basal half or more.

Carpopodites and propodites of legs, and meropodite of last pair, sharply granular as to the dorsal surface.

Colours in spirit pink, fingers brownish.

Carapace 13.5 millim. long, 18 millim. broad.

A single male from off the coast of Sind, 51 fms.

#### 129. *Actumnus elegans*, de Man.

*Actumnus elegans*, de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 47.

Carapace and exposed surfaces of legs and chelipeds covered with a thickish bright-yellow tomentum, with longer hairs on chelipeds and legs and near frontal margin.

Carapace not much more than  $\frac{2}{3}$  as long as broad, with some scattered comparatively large granules, but *with almost no indication of regions*; convex fore and aft, slightly so from side to side.

Front about a third the greatest breadth of the carapace, broadly triangular, notched at the apex, not separated from but *confluent with the supra-orbital angles*. There is a suture line in the lower orbital margin just below the outer angle.

Antero-lateral borders not shorter than the very concave postero-lateral, *armed with 7 acute spinuliform granules, in 3 pairs, with an odd one* between the first pair and the orbital angle.

Chelipeds unequal: the upper and outer surfaces of wrists and both hands, including a large part of the fingers closely studded with conical white granules.

In the Indian Museum are 2 specimens, one from Mergui the other from Kyuk Phyu Harbour.

This species seems to me to be better placed with *Pilumnus* than *Actumnus*: it and *Pilumnus scabriusculus* White, seem to be very closely related.

130. *Actumnus nudus*, A. M. Edw.

*Actumnus nudus*, A. Milne Edwards, Ann. Soc. Entomol. France, (4) VII. 1867 p. 265; de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 49, pl. ii. figs. 3, 4.

Carapace almost completely bare, legs with only a few scattered hairs.

Carapace subcircular, convex, regions hardly indicated, studded with pearl-shaped granules in its anterior and antero-lateral parts, twelve of these granules are arranged in an arched line—convex forwards—on either side of the posterior end of the gastric region.

Front much advanced, divided into two rounded oblique lobes, the outer angles of which are hardly separated from the supra-orbital angles.

Antero-lateral border divided into four teeth (not including the outer orbital angle).

Chelipeds unequal; upper and outer surfaces of hand covered with pearly granules, which also exist on the upper surface of the wrist.

Found at Pondicherry and Mergui.

Not represented in the Indian Museum collection.

This species seems to me to be improperly referred to *Actumnus*.

Alliance II. *Heteropanopioidea*.

Heteropanope.

Eurycarcinus.

Nectopanope.

## HETEROPANOPE, Stimpson, de Man.

*Heteropanope*, (part) Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 35.

*Heteropanope*, (part) A. Milne Edwards, Ann. Sci. Nat., Zool., (4) XX. 1863, pp. 288, 289.

*Pilumnopeus*, (part) A. Milne Edwards, *loc. cit.*; and Ann. Soc. Entomol. France, (4) VII. 1867, p. 277.

*Heteropanope*, de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 52.

Carapace moderately broad, moderately or little convex, with the regions little or hardly demarcated.

Antero-lateral borders shorter than the postero-lateral, cut into four lobes or teeth, of which the first is confluent with the outer angle of the orbit: postero-lateral borders moderately convergent, posterior border rather long.

Front moderately broad, between a fourth and a third the greatest breadth of the carapace, cut into two lobes, the outer angle of each of which is dentiform and separated from the supra-orbital margin by a notch.

A small triangular gap in the orbital margin just beneath the outer angle. The antennules fold nearly transversely.

Basal antennal joint short, not reaching the front; the flagellum, which is about equal in length to the major diameter of the orbit, lodged in the rather broad orbital hiatus.

The ridges of the endostome, defining the expiratory canals, are well marked, but the anterior border of the merus of the external maxillipeds is not notched. The buccal cavern is broader anteriorly than posteriorly.

Chelipeds unequal in both sexes; fingers rather short, pointed, not hollowed.

The abdomen of the male consists of seven separate segments.

*Heteropanope* closely resembles *Panopeus* (e.g. *P. herbstii*), but differs in having the crests of the endostome much more distinct, and all seven segments of the male abdomen separate.

*Key to the Indian species of Heteropanope.*

- |  |                   |
|--|-------------------|
| I. Carapace decidedly convex, both chelipeds perfectly smooth to the naked eye .....                         | <i>H. levis.</i>  |
| II. Carapace almost flat, wrist and hand of smaller cheliped studded with vesiculous or pearly granules..... | <i>H. indica.</i> |

131. *Heteropanope indica*, de Man.

*Heteropanope indica*, de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 53, pl. iii. figs. 1, 2.

Carapace more than two-thirds as long as broad, very little convex, surface somewhat granular and scantily tomentose near the margins. Gastric region and its three sub-regions faintly indicated. Two series, starting respectively from the 3rd and 4th teeth of the antero-lateral margins, of discontinuous wavy finely granular ridges cross the carapace transversely, fairly parallel with the common curve of the frontal and antero-lateral borders.

The finely granular orbital margin has the two grooves near the external angle, and the gap just below the external angle, distinct.

Antero-lateral border cut into four teeth, of which the first two are broad thin and compressed and the last two pointed and subpyramidal; the edges of all are finely granular.

Chelipeds and legs more or less tomentose. Chelipeds very unequal; a curved spine-like tooth at distal end of upper border of arm, and a spine at inner angle of wrist: upper and outer surface of smaller hand and wrist studded with vesiculous granules; larger hand quite smooth, very large, little shorter than the greatest breadth of the carapace.

Colours in spirit, dull earthy brown with a greenish tinge.

In the Indian Museum is a single specimen, from Mergui.

132. *Heteropanope lævis* (Dana).

*Panopæus lævis*, Dana, Proc. Ac. Nat. Sci. Philad. 1852, p. 76, and U. S. Expl. Exp. Crust. pt. I. p. 180, pl. viii. figs. 13a-c: J. E. Benedict and M. J. Rathbun, P. U. S. Nat. Mus. XIV. 1891, p. 380.

Carapace two-thirds as long as broad, decidedly convex fore and aft, its surface perfectly smooth to the naked eye, and bald. The gastric region and its three sub-regions are as faintly as possible indicated, and the two broken series of transverse elevations present in *H. indica* are also present, but are much blunter smoother and fainter. The orbits are as in *H. indica*, but the margin is but microscopically granular.

The antero-lateral border is cut into four teeth, all of which are thin and compressed, and all but the first are sharply acuminate forwards.

The chelipeds are extremely unequal, and are perfectly smooth and bare: there is a denticle at the distal end of the upper border of the arm, and a stout sharp tubercle (often double-crowned) at the inner angle of the wrist. The greatest length of the larger hand, in the male, is about equal to the greatest breadth of the carapace, and its greatest height more than three-quarters the greatest length of the carapace: in the female this hand is not quite so large.

The edges of the last four joints of all the legs are scantily hairy in the male, but more profusely so in the female.

Colours in spirit; brownish yellow or dull green.

In the Indian Museum are 17 specimens from Karáchi and one from Bombay.

133. *Heteropanope eucratoides*, Stimpson.

*Heteropanope eucratoides*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 35: de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 56, pl. iii. figs. 3, 4.

This species is included by de Man in the Mergui fauna. There are no specimens in the Indian Museum. According to de Man it chiefly differs from *H. indica* in having the antero-lateral margins much shorter, and the 3rd tooth of the antero-lateral margin smaller than any of the others.

The chelipeds have a smooth surface.

EURYCARCINUS, A. Milne Edwards.

*Eurycarcinus*, A. Milne Edwards, Ann. Soc. Entomol. France (4) VII. 1867, p. 276.

*Eurycarcinus*, de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 43.

Carapace broad, convex, perfectly smooth, without trace of regions.

Antero-lateral borders very much shorter than the postero-lateral, cut into four lobes or teeth, of which the first is confluent with the outer angle of the orbit: postero-lateral border moderately convergent, posterior border rather long.

Front broadish, nearly a third the greatest breadth of the carapace, obliquely deflexed, projecting a little beyond the orbits, straight and square cut, commonly emarginate in the middle line.

Orbits shallow, affording little concealment to the eyes, the upper margin entire, a gap in the lower margin, below the outer angle. The antennules fold quite transversely.

Basal antennal joint short, not reaching the front, the flagellum, which is long (much longer than the major diameter of the orbit), lodged in the orbital hiatus.

The ridges of the endostome, defining the expiratory canals, are well pronounced, but the anterior border of the merus of the external maxillipeds is not notched. Buccal cavern wider anteriorly than posteriorly.

Chelipeds unequal in both sexes, fingers pointed, not hollowed.

The abdomen of the male is seven-jointed.

*Eurycarcinus* is very closely related to *Heteropanope*, but is easily distinguished by the broad smooth convex carapace, the shallow and rather elongate orbits, and the very short antero-lateral margins.

#### *Key to the Indian species of Eurycarcinus.*

- I. Thumb of the larger cheliped with a much-enlarged tooth at basal end:—
  1. Antero-lateral border less than  $\frac{2}{3}$  the length of the postero-lateral ..... *E. orientalis*.
  2. Antero-lateral border at least  $\frac{2}{3}$  the length of the postero-lateral ..... *E. maculatus*.
- II. Thumb of the larger cheliped without a much-enlarged tooth at base .... *E. grandidieri*.

#### 134. *Eurycarcinus orientalis*, A. Milne Edwards.

*Eurycarcinus orientalis*, A. Milne Edwards, Ann. Soc. Entom. France (4) VII. 1867, p. 277: de Man, Notes Leyden Mus. XIV. 1892, p. 226.

Carapace rather over two-thirds as long as broad, perfectly smooth (except for an extremely fine and faint granular ridge that runs transversely inwards towards the gastric region from the last tooth of the antero-lateral margin), decidedly convex fore and aft and slightly so from side to side.

Front cut quite straight and square, slightly emarginate in the middle line.

Antero-lateral border cut into four thin shallow teeth, of which the first two are rounded and the last two are anteriorly acuminate, the first being the least prominent of all and the last being the smallest of all. The antero-lateral border is extremely short, a good deal less than two-thirds the length of the postero-lateral.

Supra-orbital margin entire, the infra-orbital finely denticulate.

Chelipeds markedly unequal, perfectly smooth, inner angle of wrist rather strongly pronounced; the hand and fingers are rather short and stout and the thumb of the larger cheliped is a good deal shorter than the hand and has a very strong tooth at its base.

The legs and under surface of the body are covered with a dense, extremely short scurfy tomentum.

Colours in spirit yellowish brown.

In the Indian Museum are four specimens, from Karachi, Bombay and the Andamans.

This species agrees in all respects with the descriptions and figures of *Eurycarcinus maculatus*, except in respect of the antero-lateral borders. These are so short that a line joining their posterior extremities would divide the carapace into two halves, of which the anterior would be much the smaller: the teeth of the antero-lateral border are also much shallower and less salient.

135. *Eurycarcinus grandidieri*, A. Milne Edwards.

*Eurycarcinus grandidieri*, A. Milne Edwards, Ann. Soc. Entom. France, (4) VII. 1867, p. 277; and Nouv. Archiv. du Mus. IV. 1868, p. 80, pl. xix. figs. 13-16.

Carapace about two-thirds as long as broad, strongly convex fore and aft, slightly so from side to side, perfectly smooth to the naked eye.

Front cut square, emarginate in the middle line, the fore edge straight but sloping a little obliquely from the outer angles to the middle line. Supra-orbital margin entire, the infra-orbital obscurely denticulate.

Antero-lateral border as in *E. orientalis* but rather longer, its length being at least two-thirds that of the postero-lateral; the edges of all the teeth are a little thickened and granular.

Chelipeds unequal, perfectly smooth, inner angle of wrist pronounced: the hand is more elongate and narrower and the fingers are slenderer than in *E. orientalis*, and the thumb of the larger cheliped has no enlarged tooth at the base. The legs, the smaller cheliped, and the under surface of the body are covered with a dense, extremely short and fine tomentum.

Colours in spirit, yellowish brown.

In the Indian Museum is a single specimen from the Nicobars.

The chief difference between this species and *E. orientalis* and *maculatus* appears to be in form of the hand and fingers of the larger cheliped.

136. *Eurycarcinus maculatus*, (A. M. Edw.) de Man.

*Pilumnopus maculatus*, A. Milne Edwards, Ann. Soc. Entom. France, (4) VII. 1867, p. 277; and Nouv. Archiv. du Mus. IV. 1868, p. 82, pl. xix. figs. 17-19.

*Eurycarcinus maculatus*, de Man, Journ. Linn. Soc. XXII. 1887-88. p. 44, pl. ii. figs. 2 and 3 (not 3 and 4).

The Mergui specimen described by de Man does not appear to be in the Indian Museum.

This species agrees with *E. orientalis* in the form of the chelipeds (hand and thumb), and appears to differ from that species only in having a longer and more deeply cut-up antero-lateral border.

NECTOPANOPE, Wood-Mason.

*Nectopanope* Wood-Mason, Ann. Mag. Nat. Hist. March, 1891, p. 261.

Carapace broad, approaching the quadrilateral, convex fore and aft, the branchial regions so inflated and convex dorsally as to make the transverse plane of the carapace strongly concave in the middle line, the other regions obscurely defined, the surface smooth.

The antero-lateral borders are very much shorter than the postero-lateral, are very thin and sharp, and are cut into teeth of which the first is confluent with the outer orbital angle.

Front broad, a third the greatest breadth of the carapace, straight, square cut, slightly projecting beyond the supra-orbital angle, from which it is sharply cut off by an angular notch, on either side.

Orbits large, with a thin, sharp, prominent margin; a notch internal to the middle of the upper margin, the notch breaking this margin into two curves, one corresponding to the eye-stalk the other to the cornea: eyes large, reniform, on moderately stout stalks.

Antennules folding transversely. The basal antennal joint is very short, but almost touches the turned down side-edge of the front: the flagellum, which is considerably longer than the major diameter of the large orbit, springs from the rather broad orbital hiatus.

The buccal cavern is broader anteriorly than posteriorly, and the mouth parts do not nearly reach its front edge, so that a wide and permanent gap is left: the crests of the endostome are not very strong, but the free edge of the endostome corresponding to the efferent branchial channel, on either side, is deeply excavated. The outer wall of the efferent branchial canal forms a strong angular bulge in the pterygostomian region.



The chelipeds in the female are equal; the fingers are compressed and pointed, not hollowed.

The legs are long and slender, the propodite and dactylus of the last pair strongly compressed and a little broadened.

This form is most nearly related to *Eurycarcinus*.

137. *Nectopanope rhodobaphes*, Wood-Mason.

*Nectopanope rhodobaphes*, Wood-Mason, Ann. Mag. Nat. Hist. March, 1891, p. 261.

Carapace about  $\frac{3}{4}$  as long as broad. Front extremely obscurely grooved in the middle line. Antero-lateral border cut into three thin sharp-edged teeth, of which the first is broad and rounded and confluent with the orbit, the second is broad and anteriorly acuminate, and the third almost spiniform.

Chelipeds smooth, in the female they are equal and are a little over  $1\frac{3}{4}$  times the length of the carapace: arm with an acute spine near the far end of the upper border; inner angle of wrist acute, spiniform; fingers thin, compressed, pointed and hooked at tip, armed with thin lacinate teeth, the thumb very broad.

Legs thin, the first three pairs not much shorter than the chelipeds, with long compressed-styliiform dactylus: the last pair a good deal shorter, with thin blade-like propodite and dactylus closely fringed with hair.

Colours in spirit uniform yellowish white: in life pink, with a dotted, V-shaped, white mark between the gastric and branchial regions.

In the Indian Museum is a single female specimen from off the Godávári coast 98–102 fms.

*Nectopanope longipes*, which was referred provisionally to this genus by Wood-Mason, who had insufficient material for examination, turns out, now that numerous good specimens have been dredged by the "Investigator," to be a *Catometope*.

Subfamily VII. ERIPHINÆ.

Alliance I. *Eriphioida*.

ERIPHIA, Latr.

*Eriphia*, Latreille, Cuvier Règne An. (1) III. 18.

*Eriphia*, Desmarest, Consid. Gen. Crust. p. 125.

*Eriphia*, De Haan, Faun. Japon. Crust. p. 22.

*Eriphia*, Milne Edwards, Hist. Nat. Crust. I. 425.

*Eriphia*, Dana, Silliman's Journ. (2) XII. 1851, p. 128; and U. S. Expl. Exp. Crust. pt. I. p. 246.

*Eriphia*, Heller, Crust. Sudl. Europ. p. 74.

*Eriphia*, A. Milne Edwards, and Miss. Sci. Mex. Crust. p. 337.

*Eriphia*, Miers, Challenger Brachyura p. 162.

Carapace thick and deep, approaching a quadrilateral shape, very little convex or nearly flat, not remarkably broader than long, the regions except the gastric not demarcated.

Antero-lateral borders slightly curved, much shorter than the postero-lateral and meeting the latter, not at a strong angle as in most Cancrids, but at a very open and imperceptible angle; though spinate they are not cut into lobes.

The fronto-orbital border is extremely broad, much more than three-quarters the greatest breadth of the carapace; the front, which is therefore broad also, is strongly deflexed, is almost straight, and is cut into two broad lobes the outer part of each of which is broadly in contact—far beyond the limits of the antennal base—with a singularly broad prolongation of the infra-orbital plate. The orbits, which are deep and oval, are therefore completely closed and widely separated from the antennæ.

The basal antennal joint is very small short and broad; the flagellum is long, more than the major diameter of the large orbit. The antennules fold transversely.

The crests of the endostome, defining the expiratory canals, are strong, and the canal is completed below by the foliaceous process of the first maxillipeds, the anterior edge of that process being concave. The oblique anterior border of the merus of the external maxillipeds is not notched.

Chelipeds massive, unequal in both sexes; fingers stout, pointed, not hollowed.

The abdomen of the male has all 7 segments separate.

#### *Key to the Indian species of Eriphia.*

- I. Carapace nearly  $\frac{3}{4}$  as long as broad, devoid of hair dorsally; front cut into blunt teeth:—
  1. Chelipeds smooth to the naked eye ..... *E. lævimana.*
  2. Hand and wrist of the smaller cheliped studded with tubercles ..... *E. smithii.*
- II. Carapace only  $\frac{2}{3}$  as long as broad, with numerous scattered hairs; front not cut into teeth ..... *E. scabricula.*

#### 138. *Eriphia lævimana*, Latr. Edw.

*Eriphia lævimana*, Guérin, Icon. R. A., Crust. pl. iii. fig. 1: Milne Edwards, Hist. Nat. Crust. I. 427: Dana, U. S. Expl. Exp. Crust. pt. I. p. 249, pl. xiv. figs. 7a-c: Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 37: A. Milne Edwards, in Maillard's l'île Réunion, Annexe F. p. 5, and Nouv. Archiv. du Mus. IV. 1868, p. 71, and IX. 1873, p. 255: Heller, Novara Crust. p. 24: Hilgendorf in v. d. Decken's

Reisen Ost-Afr. III. i. p. 75, and MB. Ak. Berl. 1878, p. 797: Miers, P. Z. S. 1877, p. 135, and Ann. Mag. Nat. Hist. (5) V. 1880, p. 237, and Zool. H. M. S. Alert, pp. 517, 534, and Challenger Brachyura, p. 162: Tozzetti, Magenta Crust. p. 60, pl. v. figs. 1a-c: E. Nauck, Zeits. Wiss. Zool. XXXIV. 1880, p. 58 (*gastric teeth*): Richters in Möbius Meeresf. Maurit. p. 151: Haswell, Cat. Austral. Crust. p. 75: Muller, Verh. Ges. Basel VIII. 1886, p. 475: de Man, Journ. Linn. Soc., Zool., XXII. 1887-88, p. 68, and Archiv. f. Naturges. LIII. 1887, i. 327, and Zool. Jahrb. Syst. &c. VIII. 1894-95, p. 555: Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 367: Ortman, Zool. Jahrb., Syst., VII. 1893-94, p. 480, and in Semon's Forschungsr. (Jena. Denk. VIII) Crust. p. 54: Zehntner, Rev. Suisse Zool. II. 1894, p. 161: Whitelegge, Mem. Austral. Mus. III. 1897, p. 137.

*Eriphia trapeziformis*, Hess, Archiv. für Naturges. XXXI. 1865, i. pp. 135, 171, pl. vi. fig. 4 (see de Man, Zool. Jahrb., Syst., II. 1887, p. 695).

Carapace nearly  $\frac{4}{5}$  as long as broad: gastric region large, well demarcated and subdivided into three large subregions, its anterior part, like the anterior part of the branchio-hepatic regions, covered with small pearly and subsquamiform tubercles; the rest of the carapace smooth, but closely covered with very small vesiculous granules not plainly visible to the naked eye: the post-orbital groove is distinct, and behind it, parallel with the gastric region, on each side a small narrow areola is marked off.

The free edge of the frontal lobes is bluntly spinate: there is a blunt spine also at the lower inner angle of the orbit, and two or three at the outer angle of the orbit: and there are 5 or 6 blunt spines or spinules of decreasing size along the antero-lateral border.

Chelipeds almost smooth to the naked eye, though closely covered with small depressed vesiculous granules under the lens: upper border of arm denticulate at its distal end, where also the granules on the neighbouring part of the outer surface are plainly visible without a lens; the anterior border of the arm denticulate at its proximal end. The upper part of the inner surface of the wrist forms a distinct facet, the proximal angle of which is pronounced and the distal end of which is bounded by two or three blunt spines.

Legs stout, smooth; upper edge of merus denticulate and somewhat hairy, the lower edge with tufts of stiff hair: similar tufts of hair along upper edge of carpus and on all the edges and surfaces of the propodite; the greater part of the dactylus covered with short stiff hairs and longer bristles.

Colours in spirit dull maroon, with a bluish-green tinge on the postero-lateral parts of the carapace and on the walking-legs.

In the Indian Museum are 53 specimens, from the Andamans, Arakan coast, Mergui, Ceylon and Laccadives (besides 2 from Samoa).

139. *Eriphia lævimana* var. *Smithii*, Macleay, Hilgdf.

*Eriphia smithii*, Macleay, Ill. Ann. S. Afr. p. 60: Krauss, Sudafr. Crust. p. 36, pl. ii. fig. 3: Dana, U. S. Expl. Exp. Crust. pt. I. p. 251: Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 37: A. Milne Edwards, Nouv. Archiv. du Mus. IV. 1868, p. 71: Hoffmann in Pollen and Van Dam, Faun. Madagasc., Crust. p. 6, pl. i. figs. 1a-c: Lenz and Richters, Abh. Senck. Ges. XII. 1881, p. 422: Ortmann in Semon's Forschungsgr. (Jena. Denk. VIII) Crust. p. 54.

*Eriphia lævimana* var. *smithii*, Hilgendorf MB. Ak. Berl. 1878, p. 797: Miers, Ann. Mag. Nat. Hist. (5) V. 1880, p. 237, and Zool. H. M. S. Alert, pp. 517, 535: de Man, Archiv. f. Naturges. LIII. 1887, i. p. 327: ?? Cano, Boll. Soc. Nat. Napoli, III. 1889, p. 210: A. O. Walker, Journ. Linn. Soc., Zool., XX. 1886-90, p. 110: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 481.

The variety *Smithii* differs from the typical *Eriphia lævimana* only in the sculpture of the chelipeds.

The upper and outer surfaces of the wrists and hands of the smaller cheliped are closely covered with miliary granules and are profusely studded with salient and subsquamous tubercles, which, on the lower half of the hand are arranged in longitudinal series.

The wrist and hand of the larger cheliped may be nearly smooth or may have a few scattered pustulous tubercles (as they are in most Indian specimens), or they may more nearly resemble the smaller cheliped in sculpture.

In the Indian Museum are 15 specimens from Karáchi, and one from the Mekran coast.

140. *Eriphia scabricula*, Dana.

*Eriphia scabricula*, Dana, Proc. Ac. Nat. Sci. Philad. 1852, p. 82, and U. S. Expl. Exp. Crust. pt. I. p. 247, pl. xiv. figs. 5a-b: Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 37: A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 256: Hilgendorf, MB. Ak. Berl. 1878, p. 798: Richters in Möbius Meeresf. Maurit. p. 151: Lenz and Richters, Abh. Senck. Ges. XII. 1881, p. 422: Miers, Zool. H. M. S. "Alert," pp. 518, 535: de Man, Notes Leyden Mus. XII. 1890, p. 66, and Zool. Jahrb., Syst., VIII. 1895, p. 555: Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 480: Whitelegge, Mem. Austral. Mus. III. 1897, p. 137.

*Eriphia gonagra*, Krauss (*nec* Edw.) Sudafr. Crust. p. 36.

Carapace  $\frac{3}{4}$  as long as broad, grooved on the surface as in *E. lævimana*, closely covered anteriorly and laterally with sharpish subsquamiform granules among which are numerous soft but stiffish hairs.

Free edge of frontal lobes entire, microscopically beaded. A sharp tooth at the outer angle of the orbit only. Antero-lateral border with 4 or 5 sharp teeth of gradually decreasing size.

Upper and outer surfaces of wrists and hands closely covered with vesiculous granules and sharpish pearly tubercles with numerous hairs

between them, the tubercles on the smaller hand being in longitudinal series and the hairs thick there.

Legs smooth; the borders of the last four joints, specially the upper border, fringed with longish hairs.

Colours in spirit, warm light brown, the legs in good specimens cross-banded alternate dark and light brown.

In the Indian Museum are three specimens, from the Laccadives, the Andamans and Ceylon, (also one from Samoa)

#### Alliance II. Trapezioida.

Trapezia.      Tetralia.      Quadrella.      Sphenomerus.

#### TRAPEZIA, Latreille.

*Trapezia*, Latreille, Fam. Nat. p. 269, and Encyclop. Meth. x. 695.

*Trapezia*, Milne Edwards, Hist. Nat. Crust. I. 427.

*Trapezia*, Dana, Silliman's Journ. (2) XII. 1851, p. 128, and U. S. Expl. Exp. Crust. I. p. 252.

*Trapezia*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 257 and Miss. Sci. Mex., Crust. p. 341.

*Trapezia*, Miers, Challenger Brachyura, p. 163.

*Trapezia*, Ortmann, Zool. Jahrb., Syst., X. 1897, p. 202.

*Grapsillus*, Macleay in Smith's Ill. Zool. S. Afr. p. 67.

Carapace approaching the quadrilateral, little convex, not much broader than long, smooth and without any trace of regions.

Antero-lateral borders much shorter than the postero-lateral, running backwards almost straight and parallel with one another, not therefore meeting the convex curved and convergent postero-lateral borders at any angle.

Fronto-orbital border extremely broad, about as extensive as the greatest breadth of the carapace. Front broad, horizontal, lamellar separated from the supra-orbital angle by a notch; cut into two lobes, of which both the inner and outer angles are pronounced: so that with the supra-orbital angle the front usually appears 6-toothed.

The orbits, which afford no concealment to the eyes and are large, are cut out of the antero-lateral angles of the carapace: their dentiform upper and lower inner angles are broadly in contact, so that the antennæ are widely excluded from the orbit: their margins are without fissures or sutures.

The antennules fold nearly transversely, but in most spirit specimens are extended beyond their fossæ. The basal antennal joint is slender and very short and does not nearly reach the front: the flagellum is very long, much longer than the major diameter of the orbit.

The crests of the endostome, defining the expiratory canals, are well developed and the canals are closed in below by the foliaceous process of the 1st maxillipeds: the anterior edge of the merus of the rather slender external maxillipeds is not notched.

The chelipeds are long and very massive and are sub-equal or not very unequal in both sexes: the arm usually projects a long way beyond the carapace, and has its anterior edge sharp and crest-like and serrate: the fingers have usually a thin and sharp cutting-edge, best marked on the immobile finger. Legs stout, of moderate length.

The abdomen of the male consists of 5 segments, the 3rd-5th being fused.

The species of *Trapezia* are found in the crevices of coral-stocks.

*Key to the Indian species of Trapezia.*

- I. A distinct spine or tooth at the junction of the antero-lateral and postero-lateral borders of the carapace:—
  - i. Lower border of hand sharp, entire:—
    1. Outer surface of hand, in its upper part at least, covered with a mass of fine tangled downy hairs ..... *T. cymodoce.*
    2. Outer surface of hand smooth and bald:—
      - a. Carapace and appendages plain yellowish or reddish brown ..... *T. ferruginea.*
      - b. Carapace (and sometimes also the upper surface of the hands) covered with an elegant meshwork of fine dark brown lines (a scurfy pubescence on outer surface of hand, occasionally) ..... *T. areolata.*
      - c. Carapace and appendages every where covered with roundish red spots ..... *T. maculata.*
      - d. Carapace covered with faintish brown spots, upper surface of hands with a network of brown lines ... *T. intermedia.*
    - ii. Lower border of hand granular or bluntly serrulate: carapace, etc. covered with roundish red spots ..... *T. rufopunctata.*
  - II. Nothing more than an indistinct notch at the junction of the antero-lateral and postero-lateral borders: colours, in spirit, blackish brown ..... *T. digitalis.*

With the species of *Trapezia* the citations of the various writers are so extremely uncertain that I have given up the attempt to make them complete.

Ortmann, in *Zoologische Jahrbücher, Abth. für Systematik, etc.* X. ii.

1897, pp. 201–216, has published a little monograph of the group, in which full lists of citations will be found.

141. *Trapezia cymodoce*, (Herbst) Miers, de Man, Ortmann.

*Cancer cymodoce*, Herbst, Krabben III. ii. 22, pl. li. fig. 5.

*Trapezia cymodoce*, Savigny and Audouin, Descr. de l'Égypte, Crust. p. 85, pl. v. fig. 2: Miers, Ann. Mag. Nat. Hist. (5) II. 1878, pp. 408, 409: de Man, Notes Leyden Mus. II. 1880, pp. 177, 178, and Journ. Linn. Soc., Zool., XXII. 1887-88, p. 69: Ortmann, Zool. Jahrb., Syst. X. 1897, pp. 203, 204.

*Trapezia hirtipes*, Lucas in Jacquinot's Voy. Astrolabe, Zool. III. Crust. p. 44 pl. iv. fig. 14.

*Trapezia cærulea*, Heller, SB. Ak. Wien, XLIII. 1861, p. 348.

*Trapezia dentata*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 261.

Carapace four-fifths as long as broad, slightly convex in both directions in the adult female, almost flat in the male, smooth and polished.

Front prominent beyond the supra-orbital angle, rather deeply cut into two lobes, each of which has the inner angle dentiform and still further prominent, and the outer angle (though rounded) sharply marked and separated by a deep notch from the dentiform supra-orbital angle.

Inner angle of lower edge of orbit acutely spiniform: outer angle of orbit acute.

Antero-lateral borders nearly parallel with one another or very slightly curved outwards, an acute procurved spine marks their junction with the postero-lateral borders.

Chelipeds sub-equal in both sexes: more than  $2\frac{3}{4}$  times the length of the carapace in the adult male but not quite so long in the female: the arm, which projects far beyond the edge of the carapace, has the anterior border foliaceous and cut into numerous sharp teeth: inner angle of wrist sharp and prominent, but not usually spiniform: hands long and compressed, the upper and lower edges (especially the lower) both sharp, the upper part of the outer surface of the hand (and wrist also, in many cases) covered with silky wool; fingers compressed, the cutting-edges thin sharp and not much toothed.

Legs smooth, the dactylus with rather numerous silky bristles, which are also found scattered along both edges of propus and upper edge of carpus.

Colours in spirit yellowish or reddish brown, often very dark or livid on the carapace; distal two-thirds of fingers commonly dark brown.

In the Indian Museum are 37 specimens, from the Andamans, Nicobars, Mergui, Palk Straits and the Mekran coast (besides 16 from other parts of the Indo-Pacific).

In some specimens the free edge of the frontal lobes is more or less crenulate: the outer angle of the orbit and the lateral epibranchial spine are sometimes blunt: the whole of the outer surface of the hand is sometimes pubescent, and the arm also.

The species can, however, always be recognized by the uniform colouration, the hairy outer surface of the hands, and the very prominent front.

142. *Trapezia ferruginea*, Latr., Miers, de Man, Ortmann.

*Trapezia ferruginea*, Latreille, Encycl. Meth. X. p. 695: Milne Edwards, Hist. Nat. Crust. I. 429: Heller, SB. Ak. Wien, XLIII. 1861 p. 349, pl. iv. fig. 40: Miers, Ann. Mag. Nat. Hist. (5) II. 1878, pp. 407, 408: de Man, Notes Leyden Mus. II. 1880, pp. 178, 179: Ortmann, Zool. Jahrb. Syst., X. 1897, pp. 202, 205.

*Grapsillus subinteger*, Macleay in Smith's Ill. Zool. S. Afr., Annulosa, p. 67.

*Trapezia cymodoce*, Dana, U. S. Expl. Exp. Crust. pt. I. 257, pl. xv. fig. 5, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 260, and Miss. Sci. Mex. Crust. p. 342.

*Trapezia miniata*, Lucas in Jacquinot's Voy. Astrolabe, Zool. III. Crust. p. 43, pl. iv. fig. 10.

*Trapezia subdentata*, Gerstaecker, Archiv. für Naturges. XXII. 1856, i. p. 127.

Differs from *T. cymodoce*, which it closely resembles in form and colour, in the following particulars:—

(1) the front as a whole is not so prominent, and its constituent teeth, as well as the supra-orbital angle, are not so prominent, and deep-cut: the tooth at the lower inner angle of the orbit is not so sharp:

(2) the outer angle of the orbit and the lateral epibranchial spine are not nearly so spiniform in the adult:

(3) the upper border of the hand is not so sharp, and the outer surface of the hand is smooth, polished and quite hairless.

In the Indian Museum are 25 specimens, from the Andamans, Nicobars and Ceylon.

*Trapezia ferruginea* var. *intermedia*, Miers.

*Trapezia rufopunctata* var. *intermedia*, Miers, Challenger Brachyura, p. 163, pl. xii. fig. 2, 1886.

*Trapezia*, sp. Richters in Möbius, Meeresf. Maurit. p. 152, pl. xvi. fig. 13, 1880.

Differs from *T. ferruginea* only in colouration.

The carapace, legs, arms and wrists are covered with light brown rather blotchy spots, while the upper surface of the hands is marked by a network of fine brown lines.

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*Trapezia ferruginea* var. *guttata*, Rüpp.

Carapace light brown, edge of front brick-red: chelipeds with a network of fine pinkish-brown lines: legs with small pink spots.

Twelve specimens have just been dredged by Dr. A. R. S. Anderson of the "Investigator," off Great Coco I. (Andamans).



A faded specimen could not be distinguished from *T. ferruginea*.

In the Indian Museum are 3 specimens, from Diamond Island (off C. Negrais, Burma).

The Museum also possesses one of the "Challenger" duplicates from Honolulu.

143. *Trapezia ferruginea* var. *areolata*, Dana.

*Trapezia areolata*, Dana, Proc. Acad. Nat. Sci. Philad. 1852, p. 83, and U. S. Expl. Exp. Crust. pt. I. p. 259, pl. xv. figs. 8a-b and 9: Heller, Novara Crust. p. 25: de Man, Archiv. für Naturges. LIII. 1887, i. p. 317, and Zool. Jahrb. Syst. VIII. 1894-95, p. 556: Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 366: Ortmann, Zool. Jahrb. Syst. VII. 1893-94, p. 485.

*Trapezia reticulata*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 37.

*Trapezia areolata* var. *inermis*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 259, pl. x. fig. 6: Miers, Challenger Brachyura, p. 167: Zehntner, Rev. Suisse Zool. V. 1894, p. 157.

*Trapezia ferruginea areolata*, Ortmann, Zool. Jahrb., Syst., X. 1897, pp. 203, 206.

This species also differs from *T. ferruginea* only in colouration.

The carapace, and sometimes also the upper surface of the chelipeds, is covered by a very elegant honeycomb network of fine brown (in spirit) lines. Even in old spirit specimens this network can be made out, with a lens, on the carapace, though not on the chelipeds.

In many specimens of *T. areolata*, the upper part of the outer surface of the hand is covered with a very fine scurf-like pubescence.

In the Indian Museum are 52 specimens, from the Audamans, Nicobars, Ceylon and Mergui (besides 3 from other parts of the Indo-Pacific).

144. *Trapezia maculata* (Macleay) Dana.

*Grapsillus maculatus*, Macleay in Smith's Ill. Zool. S. Afr., Ann. p. 67.

*Trapezia tigrina*, Eydoux and Sonleyet, Voy. Bonite, Vol. I. p. 232, pl. ii. fig. 4.

*Trapezia maculata*, Dana, U. S. Expl. Exp. Crust. pt. I. p. 256, pl. xv. figs. 4a-d: Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 37, and Ann. Lyc. Nat. Hist., N. York, VII. 1862, p. 219: Streets, Bull. U. S. Nat. Mus. VII. 1877, p. 106: de Man, Archiv. für Naturges. LIII. 1887, i. p. 318, pl. xiii. fig. 2: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 366.

*Trapezia rufopunctata* var. *maculata*, Miers, Phil. Trans. Roy. Soc., Vol. 168, 1879, p. 487: Ortmann, Zool. Jahrb., Syst. VII. 1893-94 p. 484.

*Trapezia ferruginea maculata*, Ortmann, Zool. Jahrb., Syst., X. 1897, pp. 203, 206.

Differs from *T. cymodoce* in the following particulars:—

(1) the front as a whole is not so prominent, nor are its constituent teeth and the supra-orbital angle quite so deep-cut:

(2) the chelipeds are not much more than twice the length of the carapace in the male, the arm being shorter than in *T. cymodoce* and *ferruginea*; there is a strong spine at the inner angle of the wrist; the outer surface of the hand is smooth, polished and hairless:

(3) the carapace, chelipeds, legs, etc., are everywhere covered with well defined roundish red spots.

*N.B.* The lower border of the hand is sharp and entire (non-granular, non-serrulate).

In the Indian Museum are four specimens from Table Island (north of the Andamans).

145. *Trapezia rufopunctata* (Herbst) Latr., Ortmann.

*Cancer rufopunctatus*, Herbst, Krabben III. i. 54, pl. xlvii. fig. 6.

*Trapezia rufopunctata*, Latreille, Encyclop. X. p. 695: Dana, U. S. Expl. Exp., Crust. pt. I. p. 255, pl. xv. figs. 3a-b: Lucas in Jacquinot's Voy. Astrolabe, Zool. III. Crust. p. 41, pl. iv. fig. 8: Gerstaecker, Archiv. für Naturges. XXII. 1856, i. p. 123: Heller, SB. Ak. Wien, XLIII. 1861, p. 350: A. Milne Edwards, Nouv. Archiv. du Mus. IV. 1868, p. 71, and IX. 1873, p. 258, and Miss. Sci. Mex. Crust. p. 342: Hilgendorf in v. d. Decken's Reisen Ost-Afr. III. i. p. 75, pl. ii. fig. 3: Kossman, Reise roth. Meer., Crust. p. 42: Miers, Challenger Brachyura, p. 167: de Man, Archiv. für Naturges. LIII. 1887, i. p. 318, pl. xiii. figs. 1, 2: J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 366: Ortmann, Zool. Jahrb., Syst. VII. 1893-94, p. 484, and X. 1897, pp. 205, 207, and in Semon's Forschungsgr. (Jena. Denk. VIII.) Crust. p. 52: Zehntner, Rev. Suisse Zool. II. 1894, p. 157.

*Trapezia acutifrons*, A. Milne Edwards, Ann. Soc. Eutom, France, (4) VII. 1867, p. 281.

Differs from *T. cymodoce* as follows:—

(1) though the front is of the same general form, the edge of each frontal lobe is somewhat angularly excised and the outer angle is angularly acute (not rounded) and is produced to or even beyond the level of the dentiform inner angle of each lobe:

(2) the inner angle of the wrist is more acute and spiniform, the upper border of the hand is rounded and the outer surface smooth polished and hairless, and the lower border of the hand is granular or bluntly serrulate:

(3) the carapace, chelipeds and legs are covered with rather large red spots.

In the Indian Museum are 5 specimens from Ceylon.

146. *Trapezia digitalis*, Latr.

*Trapezia digitalis*, Latreille, Encycl. Meth. X. 696: Milne Edwards, Hist. Nat. Crust. I. 429: Heller, SB. Ak. Wien, XLIII. 1861, p. 352: Kossmann, Reise roth. Meer., Crust. p. 42: de Man, Notes Leyden Mus. II. 1880, p. 177: Ortmann, Zool. Jahrb. Syst. X. 1897, p. 203, 208.

*Trapezia leucodactyla*, Rüppell, 24 Krabben roth. Meer. p. 28.

? *Trapezia fusca*, Lucas in Jacquinot's Voy. Astrolabe, Zool. III. Crust. p. 45, pl. iv. fig. 17.

Carapace about five-sixths as long as broad, but having a broader look, owing to the less marked projection of the front and the greater

curvature and convergence of the postero-lateral borders; its surface smooth and burnished.

The front is slightly notched in the middle line, and is separated from the hardly-dentiform supra-orbital angles by a shallow notch: it is thus rather obscurely divided into two lobes, each of which has the free edge finely denticulate. Outer angle of orbit acute, as is also the inner angle of the lower margin.

There may be a slight notch at the junction of the antero-lateral and postero-lateral borders, but there is never a spine.

Chelipeds subequal in both sexes, about twice the length of the carapace, smooth and burnished. The arm is much shorter than it is in *T. cymodoce* and *ferruginea*, being broader than long, its foliaceous anterior border dentate or crenate; inner angle of wrist acute; upper border of hand rounded, lower border sharp.

Legs smooth, dactylus with a few bristles, which are almost absent from the other joints.

Colours in spirit, blackish-brown, fingers, lower edge of hand and distal ends of leg joints lighter.

In the Indian Museum are six specimens from Ceylon and Palk Straits.

#### TETRALIA, Dana.

*Tetralia*, Dana, Silliman's Journ. Sci. and Arts (2) XII. 1851, p. 128, and Proc. Ac. Nat. Sci. Phila., 1852, p. 83, and U. S. Expl. Exp. Crust. pt. I. p. 261.

*Tetralia*, Heller, SB. Ak. Wien, XLIII. 1861, p. 353.

*Tetralia*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 261.

Closely resembles *Trapezia* in form, and only differs in the following characters:—

The front is hardly separated from the hardly-dentiform supra-orbital angle by a small and very inconspicuous notch, and has its free edge very slightly convex, very faintly sinuous or straight (instead of being divided into lobes or teeth), and finely denticulate.

The antero-lateral borders are usually continued into the postero-lateral without any trace of a spine or notch to mark their junction.

The eyes are smaller.

The chelipeds are usually remarkably unequal; the arms are shorter and their expanded anterior edge is not denticulate throughout.

The meropodites of the legs are short and broad, almost foliaceous.

The abdomen of the male consists of seven separate segments.

#### 147. *Tetralia glaberrima* (Herbst.).

*Cancer glaberrimus*, Herbst, Krabben I. ii. 262 pl. xx. fig. 115.

*Trapezia integra*, Latreille, Encycl. Meth. x. p. 696.

*Trapezia glaberrima*, Krauss, Sudafr. Crust. p. 35.

*Tetralia glaberrima*, Dana, U. S. Expl. Exp. Crust. pt. i. p. 263, pl. xvi. fig. 3 : Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 38 : A Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 262 : Kossmann, Reise roth. Meer. Crust. p. 46 : Lenz and Richters, Abh. senck. Ges. XII. 1881, p. 422; de Man, Archiv. für Naturges. LIII. 1887, i. p. 321 : J. R. Henderson, Trans. Linn. Soc., Zool., (2) V. 1893, p. 366 : Ortmann, Zool. Jahrb., Syst., VII. 1893-94, p. 485, and X. 1897, p. 209, and in Semon's Forschungsr. (Jena. Denk. VIII.) Crust. p. 53 : Zehntner, Rev. Suisse Zool. II. 1894, p. 157.

*Tetralia nigrifrons*, Dana, Proc. Ac. Nat. Sci. Philad. 1852, p. 83, and U. S. Expl. Exp. Crust. pt. i. p. 262, pl. xvi. figs. 2a-d : A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 262 : Hilgendorf, MB. Ak. Berl. 1878, p. 798.

*Trapezia serratifrons*, Lucas in Jacquinot's Voy. Astrolabe, Zool., III. Crust. p. 47, pl. iv. fig. 20.

*Tetralia levissima*, Stimpson, Proc. Ac. Nat. Sci. Philad. 1858, p. 38.

*Tetralia cavimana*, Heller, Abh. zool.-bot. Ges. Wien. XI. 1861, p. 14, and SB. Ak. Wien. XLIII. 1861, p. 353, pl. iii. figs. 24, 25, and Novara Crust. p. 26 : Miers, Phil. Trans. 168, 1879, p. 488, and Zool. H. M. S. Alert, pp. 518, 537 : de Man, Notes Leyden Mus., II. 1880, p. 180 : R. I. Pocock, Ann. Mag. Nat. Hist. (6) V. 1890, p. 73 : Whitelegge, Mem. Austral. Mus. III. 1897, p. 138.

*Tetralia heterodactyla*, Heller, Abh. zool.-bot. Ges. Wien. XI. 1861, p. 14, and SB. Ak. Wien. XLIII. 1861, p. 354.

Carapace about five-sixths as long as broad, flat smooth and shiny, with occasionally a faint short and distant pubescence near the frontal and lateral margins.

The front is finely and evenly denticulate, is almost straight, and is generally but not always separated from the similarly denticulate supra-orbital angle by a slight and inconspicuous break. The lateral borders are very slightly curved in their anterior half and are moderately convergent in their posterior half : they show no trace of a spine or notch, at least in the adult.

The chelipeds are very unequal both in length and bulk in both sexes, but even more so in the male than in the female.

In the male the larger cheliped is a good deal more and the smaller a good deal less than twice the length of the carapace : in the female the larger is about  $1\frac{3}{4}$  times and the smaller about  $1\frac{1}{3}$  times the length of the carapace.

The arm has the distal end of its anterior border expanded and finely denticulate : a little down and a few hairs are present on the outer surface of the wrist hand and finger, especially in the larger cheliped.

At the base of the larger hand, on the upper part of the outer surface, is a roundish pit of variable size and depth and usually full of hair.

The legs are rather short and stout and end in a curious little

coarse blunt claw: the meropodites are singularly broad and flat: the dactyli and propodites have both edges, and the carpopodites the upper edge, somewhat hairy.

Colours in spirit rather variable: sometimes uniform yellow or brown, usually the edge of the front and of the anterior part of the lateral margin is darker—almost black; occasionally the ends of some of the leg-joints have a black spot, and sometimes the legs are broadly banded yellow and blackish-brown.

In the Indian Museum are 78 specimens, from the Andamans, Mergui, Ceylon, the Maldives and the Mekrán coast.

In some but not in all young specimens there is a small lateral spine placed far forward on either lateral border of the carapace.

#### QUADRELLA, Dana.

*Quadrella*, Dana, Silliman's Amer. Journ. Sci. and Arts (2) XII. 1851, p. 128, and Proc. Ac. Nat. Sci. Philad. 1852, p. 84, and U. S. Expl. Exp. Crust. pt. i. p. 265.

*Quadrella*, A. Milne Edwards, Miss. Sci. Mex. Crust. p. 344.

Carapace squarely hexagonal, nearly as long as broad, moderately convex, perfectly smooth without trace of regions.

The antero-lateral borders, which are about equal in length to the postero-lateral, are straight, slope very slightly outwards, and join the postero-lateral at a very wide, but distinct, angle, marked usually by a spine.

The fronto-orbital border is about equal in extent to the greatest breadth of the carapace, and the broad almost horizontal front is cut into four acute spines, external to which, on either side, is seen the acute spiniform internal angle of the lower edge of the orbit projecting beyond the acute supra-orbital angles; so that the front is commonly spoken of as six-spinate.

The orbits, which are small and are cut out of the antero-lateral angles of the carapace, afford no concealment to the eyes: their upper and lower inner angles are in contact so as to exclude the antennæ.

The antennæ fold almost transversely. The basal antennal joint is slender and does not nearly reach the front; the flagellum is slender and long—nearly half the length of the carapace.

The crests of the endostome are distinct and the expiratory canals are closed in as in *Trapezia*, etc.

The chelipeds are massive but are of great length, the whole of the long arm projecting beyond the edge of the carapace: they are subequal, or not markedly unequal, in both sexes.

Legs long and slender, the dactyli strongly and evenly serrated along the inner edge.

The abdomen of the male consists of 5 segments, the 3rd-5th being fused together.

The species of this genus inhabit stocks of corals and Alcyonarians.

148. *Quadrella coronata*, Dana.

*Quadrella coronata*, Dana, Proc. Acad. Nat. Sci. Philad., 1852, p. 84, and U. S. Expl. Exp. Crust. pt. i. p. 266, pl. xvi. figs. 5a-d: Ortmann, Zool. Jahrb. Syst. X. 1897, p. 210.

*Trapezia* sp. Miers, Zool. H. M. S. Alert, p. 536, footnote, (see Challenger Brachyura, p. 163 footnote).

Carapace squarely hexagonal, moderately convex, perfectly smooth, polished, about as long as broad. An acute procurved spine at the open angle of junction of the antero-lateral and postero-lateral borders.

Front with 6 horizontal spines, the four larger of which belong to the front proper, the other two being at the lower inner angles of the orbits which are much more prominent than the also spiniform upper inner angles.

Outer angle of orbit acute: eyes small, the diameter of the cornea about a tenth the length of the carapace.

Chelipeds smooth and polished, about  $2\frac{3}{4}$  times the length of the carapace, the arm and the palm each being nearly as long as the carapace. The whole arm, as well as the end of the ischium, visible, from above, beyond the carapace; an acicular spine at the inner angle of the ischium and from six to ten such spines along inner (anterior) border of arm; one, or two, little spines sometimes, but not always, present at inner angle of wrist: lower border of hand quite smooth.

Legs long slender, about  $1\frac{3}{4}$  times the length of the carapace: a few silky hairs on dactylus and propodite, and sometimes a very few on the carpus also: the inner edge of the dactylus strongly toothed.

Colours in spirit, milkwhite.

In the Indian Museum are 9 specimens from various parts of the Indian coasts and islands and from depths of 28 to 88 fathoms (one specimen from ? 7 fathoms).

*Quadrella coronata* var. *maculosa*, nov.

Differs from the typical form in the following particulars:—

(1) the greatest breadth of the carapace is distinctly more than the greatest length (including frontal spines):

(2) the chelipeds, under a lens, are frosted over with tiny granules: the anterior border of the arm is finely denticulate, with 2 or 3 spines at the distal end only; the inner border of the hand and thumb is finely denticulate:

(3) the carapace is closely covered with tiny purple (in spirit) dots, except for a very distinctly defined **W**-shaped white area stretching across its posterior half: the legs, sternum and abdominal terga are less closely covered with similar purple specks: chelipeds white.

Length of carapace 7 millim., breadth 8 millim.

In the Indian Museum are a male from off Table I. (Andamans) 15-35 fms., and a female from off the Andamans, 20 fms.

*Quadrella coronata*, var. *reticulata*, nov.

Differs from the typical form in the following particulars:—

(1) the carapace is distinctly broader than long:

(2) the chelipeds in the male are only about  $2\frac{1}{2}$  times the greatest length of the carapace, and under the lens are more or less frosted over with granules: the anterior border of the arm is serrate, the inner border of the hand and thumb is finely denticulate:

(3) the carapace is symmetrically traversed by several fine purple-brown lines which intersect to form a regular and wide meshwork, and there is an irregular meshwork of similar coloured lines on the hands.

Length of carapace 7 millim., breadth 8 millim.

In the Indian Museum are a male from the Andamans, taken on a *Spongodes*, and two from off Ceylon 34 fms.

149. *Quadrella boopsis*, n. sp.

Differs from *Q. coronata* in the following particulars:—

(1) the chelipeds in the male are only about twice the greatest breadth of the carapace:

(2) the arm is stout, is only about three-fifths the greatest length of the carapace, and has its anterior border serrated, not spiniferous:

(3) the eyes are large, their diameter being about one-fifth the greatest length of the carapace:

Colours in spirit uniform yellowish.

Length of carapace equal with the breadth, which is 5 millim.

In the Indian Museum are a male and a female from the Arakan coast 20-30 fms.

This species is not the young of *Q. coronata*, which has the long slender arm and small eyes of the adult.

SPHENOMERUS, Wood-Mason.

*Sphenomerus*, Wood-Mason, Ann. Mag. Nat. Hist. March 1891, p. 263.

Carapace transversely oval or subcircular, the front and antero-lateral margins forming together a semicircle; markedly convex in both directions, perfectly smooth, without trace of regions.

Antero-lateral borders shorter than the postero-lateral—a spinule at their point of junction.

Front somewhat deflexed, broad and broadly bilobed. Orbits affording little or no concealment to the eyes, without fissures or sutures: there is a gap between the front and the inner angle of the orbit in which the antennary flagellum is lodged. The fronto-orbital border, in the adult, is not quite  $\frac{4}{5}$  the greatest breadth of the carapace.

The antennules fold nearly transversely: the basal antennal joint does not reach the front, the flagellum is a good deal longer than the major diameter of the orbit.

The buccal cavern is a little narrowed anteriorly. The crests of the endostome are very faint, but to make up for this the anterior edge of the buccal cavern is puffed out and is very deeply excised on either side of the middle line; the anterior margin of the foliaceous process of the 1st maxillipeds is also excised to correspond, and so a permanent expiratory orifice is formed, which is very large and prominent beyond the almost transverse anterior edge of the merus of the external maxillipeds.

The chelipeds are stout, very long and not very unequal; the whole of the arm projects beyond the edge of the carapace: the fingers are somewhat compressed and are pointed.

The legs are rather slender.

The abdomen of the male consists of five pieces, the 3-5th somites being rigidly united but without obliteration of sutures.

#### 150. *Sphenomerus trapezioides*, Wood-Mason.

*Sphenomerus trapezioides*, Wood-Mason, Ann. Mag. Nat. Hist. March 1891, p. 263: Ill. Zool. Investigator, Crust. pl. v. fig. 2 (where the carapace is drawn a little too broad).

Carapace about  $\frac{4}{5}$  as long as broad, convex in all directions, smooth, polished.

The front is about  $\frac{3}{4}$  the greatest breadth of the carapace, is obliquely deflexed, and is divided into two rather shallow broadly-rounded lobes the free edge of which is entire.

The supra-orbital angle is not defined, but the dentiform or spini-form angle of the lower edge of the orbit can be seen from above.

The antero-lateral margins form with the front a semicircular curve, each carries three sharp spinules, namely, one at the outer angle of the orbit, one at the junction with the postero-lateral border and one exactly intermediate between the other two.

The chelipeds are a little, but not very remarkably, unequal: the larger one is about  $2\frac{1}{2}$  times the length of the carapace. Their surface is smooth and polished. The arm, the whole of which is visible beyond



the carapace, has much the same shape as in *Trapezia*, but its anterior border, though serrated, is not expanded; the lower border of the hand is sharp and somewhat dilated posteriorly, as in *Trapezia*: the inner angle of the wrist is rounded, but sometimes carries a small spinule.

The legs are slender smooth and polished, and have a few hairs distally.

Colours in spirit yellowish white, fingers sometimes blackish in their basal half.

Length of carapace of largest specimen 9 millim., breadth 11 millim.

In the Indian Museum are 11 specimens from the Andaman Sea at depths between 130 and 290 fms.

### Alliance III. *Domecioida.*

#### DOMECIA, Eydoux and Souleyet.

*Domecia*, Eydoux and Souleyet, Voy. Bonite, Crust. Zool. vol. i. p. 234: Lucas in Jacquinot's Voy. Astrolabe, Zool. vol. iii. Crust. p. 48.

*Domaecius*, Dana, Silliman's Amer. Journ. Sci. and Arts, (2) XII. 1851, p. 128, and U. S. Expl. Exp. Crust. pt. i. pp. 230, 251.

*Domecia*, A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 263, and Miss. Sci. Mex. Crust. p. 345.

? *Neleus*, Desbonne and Schramm, Crust. Gaudaloupe, p. 35.

Carapace somewhat oval transversely but much contracted posteriorly, flat, somewhat hairy, with no trace of regions.

The fronto-orbital border is not much less than the greatest breadth of the carapace. The front is profusely spinate, the spines being sharp, a little curved, and falling into about six tufts or groups separated by more or less well-marked intervals.

The antero-lateral borders pass backwards with but little outward slope: they are a little shorter than the concave and convergent postero-lateral borders, and are armed with numerous sharp curved spines.

The orbits are at the antero-lateral angles of the carapace and do not conceal the eyes, their edge shows no fissures or sutures: their upper and lower inner angles are broadly in contact, or almost in contact, so as to exclude the antennæ.

The antennules fold nearly transversely. The basal antennal joint hardly reaches the front, though its outer angle is produced towards the front: the flagellum is short—hardly as long as the orbit.

The buccal cavern is broad: the crests of the endostome are not very strong; nor is the foliaceous process of the 1st maxillipeds produced far forwards: the external maxillipeds are very large, and the merus is remarkably broad and short.

The chelipeds are somewhat unequal, and are short and not very massive: the arm is almost entirely hidden by the carapace: fingers compressed, pointed.

The legs are stout, especially the meropodites.

The abdomen of the male has all 7 segments distinct and separate.

151. *Domecia hispida*, Eydoux and Souleyet.

*Domecia hispida*, Eydoux and Souleyet, Voy. Bonite, Zool. vol. i. p. 235, pl. ii. figs. 5-10: Dana, U. S. Expl. Exp. Crust. pt. I. p. 251: Lucas in Jacquinot's Voy. Astrolabe, Zool. vol. iii. Crust. p. 50, pl. iv. fig. 3-7: Stimpson, Bull. Mus. Comp. Zool. II. 1870-71, p. 145: A. Milne Edwards, Nouv. Archiv. du Mus. IX. 1873, p. 263, and Miss. Sci. Mex. Crust. p. 345, pl. lviii. fig. 2 (not good): de Man, Archiv. für Naturges. LIII. 1887, i. p. 326: Ortmann, Zool. Jahrb., Syst. VII. 1893-94, p. 478.

? *Neleus acanthophorus*, Desbonne and Schramm, Crust. Guadeloupe, p. 35.

? *Eupilumnus websteri*, Kingsley, Proc. Ac. Nat. Sci. Philad. 1879, p. 397, pl. xiv. fig. 3.

Carapace covered with light-coloured hairs: antero-lateral border with five or six (including the orbital angle) acute dark-tipped spines, and several similar spines on the carapace just inside the antero-lateral border, and also just inside the spiny fronto-orbital border. The orbital margin and the prominent edge of the epistome are finely denticulate.

Merus of the external maxillipeds extremely broad and short, with an elevated patch of denticles on its outer surface.

Chelipeds a little unequal, the larger one is not very much longer than the carapace: the arm, wrist, hand and dactylus are all studded with acute spines.

Legs stout, not very much shorter than the chelipeds: the anterior surface of the last four joints fringed with hairs, and the anterior edge of the merus spinate, as also, but much less distinctly, is the anterior edge of the carpus and propus.

Colours in spirit, yellow with brown blotches on the carapace and chelipeds and indistinct dusky cross-bands on the legs.

In the Indian Museum are a male and female from off Little Andaman I., 10 fms., and two females from Great Coco I.

Alliance IV. *Melioida*.

MELIA, Latreille, Edw.

*Melia*, Latreille, Encycl. Meth. X. 705.

*Melia*, Milne Edwards, Hist. Nat. Crust. I. 431.

*Melia*, Dana, Silliman's Journal (2) XII. 1851, p. 128, and U. S. Expl. Exp. Crust. pt. I. p. 242.

Carapace rather depressed and narrow, hexagonal, not concealing the first  $2\frac{1}{2}$  or 3 abdominal terga even in the male, the regions not, or fairly distinctly, delimited.

Fronto-orbital border more than  $\frac{3}{4}$  the greatest breadth of the carapace. Orbits very shallow, affording little concealment to the eyes. Antennules folding obliquely.

Basal antennal joint slender, of good length but yet hardly touching the front; the flagellum very long (half the length of the carapace, or more), lodged in the orbital hiatus.

*Chelipeds* slenderer and much shorter than the walking-legs; the hand often hidden in a matted tuft of hair.

Walking-legs long and stout, *the third pair the longest of all.*

External maxillipeds somewhat slender and almost subpediform.

Both the Indian species of this genus differ from *Melia tessellata* (of which there are several specimens in the Indian Museum collection) in having the carapace rugulose, the antero-lateral border crenulate, the front more prominent, and the regions fairly well delimited and areolated.

152. *Melia cæstifer*, n. sp.

Carapace hexagonal, about as long as broad, rugulose or tuberculous, somewhat pubescent posteriorly and laterally, the regions fairly well defined and areolated.

Front broad, sublaminar, square-cut, horizontal but on a lower plane than the gastric region.

Antero-lateral border cut into three blunt lobes, the first of which is confluent with the outer orbital angle.

Antennary flagellum very long.

Chelipeds extremely slender; hand hidden in a tuft of adherent hair, which has to be removed before the slender hooked fingers can be seen.

First pair of legs somewhat more slender than the others, and shorter than the last pair; the second and third pair stouter and longer than the others, the third pair being the longest and the stoutest (especially as to the merus) of all. All the legs are more or less pubescent.

The abdomen of the male consists of 5 segments, the 3rd-5th being fused.

Colours in spirit, white, the bases of all the rugosities or tubercles defined by more or less circular very fine dark lines.

Length of carapace barely 4 millim., breadth hardly over 4 millim.

In the Indian Museum are a male and a female from off Ceylon, 34 fms.

153. *Melia pugil*, n. sp.

Differs from *M. cæstifer* (females compared) in the following characters:—

(1) the carapace is distinctly broader than long:

(2) the regions though as well defined are not nearly so much broken up into tubercles :

(3) just behind the 3rd tooth of the antero-lateral margin is a distinct indentation, making the anterior end of the postero-lateral border dentiform :

(4) the chelipeds are distinctly stouter and the hand is concealed in a fleshy glove :

(5) the first pair of legs is as stout as the fourth.

Length of carapace 5 millim., breadth 7 millim.

Colours in spirit, white, with a wider and more angular network of fine dark lines.

In the Indian Museum is a single female from off Ceylon, 26½ fms.

### Appendix to *Hyperolissa* ?

#### PLATYPILUMNUS, Wood-Mason.

*Platypilumnus*, Wood-Mason MS., Alcock, Ann. Mag. Nat. Hist. May 1894, p 401.

Carapace hexagonal—the prominent bilaminar horizontally-projecting front forming the shortest side of the hexagon—thin, depressed, perfectly flat, with the regions and subregions very faintly impressed: the antero-lateral borders are spinate, the postero-lateral are slightly convergent, and the posterior border is long.

Front about a third the greatest breadth of the carapace. Upper margin of orbit spinate, the inner angle of the lower margin acutely spiniform.

The antennules fold transversely. The basal antennal joint, though of fair length, does not reach the front; the next joint lies loosely in the wide orbital hiatus; the antennary flagellum is long, about twice the major diameter of the orbit.

Buccal cavern quadrangular, very well defined anteriorly; the external maxillipeds do not nearly cover it, but leave the efferent branchial channels permanently widely open; the endostomial ridges that define these last are well defined posteriorly, but do not reach the anterior border of the buccal cavern.

Chelipeds in the female, markedly unequal, fingers long, pointed.

Legs long, slender, compressed, spiny.

As there is only a single female in the Indian Museum, I cannot be sure of the place of this genus in the system. It probably belongs to the *Cancroidea*, and should be placed near *Galene*.

*Platypilumnus gracilipes*, Wood-Mason.

*Platypilumnus gracilipes*, Wood-Mason MS., Alcock, Ann. Mag. Nat. Hist. May, 1894, p. 401: Ill. Zool. Investigator, Crust. pl. xiv. fig. 6.

Carapace much depressed, perfectly flat above, with the surface nearly smooth centrally and very finely and closely granular laterally, and with the regions indistinctly defined. The front has the form of a horizontally projecting bilobed lamella, with the free edge sharply and very evenly spinate and the sides turned abruptly downwards. The margins of the orbit are spinulate, the upper margin the more distinctly so, and the lower margin terminates internally in a strong oblique spine, the point of which inclines towards the sharply vertical tooth formed by the already mentioned downfolding of the lateral edge of the frontal lamella.

The antero-lateral borders of the carapace which are arcuate and are shorter than the postero-lateral, are armed with three large spines, in front of, between, and behind which are several spinules.

The pterygostomial regions are large and inflated, and the branchial apertures, especially the efferent aperture, are large and patulous.

The eye-stalks are large and are of moderate length; the corneal region is rather small.

The antennules are long and are transversely folded, their basal joint is large and inflated.

The antennæ are long, their basal joint is slender and free; the second joint lies loosely in the internal orbital hiatus.

The inner edge of the meropodite of the external maxillipeds is convex, with a pair of little spines at the summit of the convexity; the succeeding joint arises at the antero-internal angle.

The thoracic legs are furnished with many spines and long hairs. The chelipeds, which are robust, are unequal; their prismatic arm has all its borders spiny; the short inflated wrist is sharply granular and spinulate in the distal half of its dorsal surface and along the outer edge, while the inner edge bears a pair of rather large spines; the hand is spinulate everywhere in the smaller cheliped, but only in the proximal third of its outer surface in the larger; the fingers also of the smaller cheliped are spinulate on the outer surface, while those of the larger cheliped are smooth; the cutting-edges of the fingers are finely and unevenly toothed.

The other thoracic legs are long, compressed, and slender, and have the meropodite spiny along both edges, the carpopodite and propodite spiny along the front edge, and the dactylopodite styliiform.

Colour in the fresh state yellowish red.

Andaman Sea, 188-220 fms. A single female.

*Contribution from the Chemical Laboratory, Presidency College, Calcutta.*  
*On Double Thiosulphates of Copper and Sodium.*—By CHANDRA  
 BHUSHAN BHADURI, B.A., and JYOTI BHUSHAN BHADURI, M.A.  
 PREM CHAND ROYCHAND SCHOLAR. Communicated by ALEX. PEDLER,  
 F.R.S.

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When working with the preparation of a few normal sulphites and particularly during an attempt to prepare normal cuprous and cupric sulphites, we had occasionally to use sodium thiosulphate instead of sodium sulphite or sulphur dioxide dissolved in water. It was soon found that a beautiful yellow salt separates, on allowing a mixture of sodium thiosulphate and copper sulphate solutions to stand for some time, in microscopic needles which however decomposes readily in a day or two unless special care is taken to get it perfectly dry. By varying the concentration and proportion, with or without addition of alcohol, the colour of the salts obtained seemed to change considerably. We undertook to analyse some of them, and the result of the analyses forms the subject matter of the present paper.

But before proceeding to describe our work a brief notice of the work done by previous chemists on the subject may not be out of place. The following list includes all the salts known at present.

Cuprous Sodium thiosulphate:—

- (1)  $2 \text{Cu}_2\text{S}_2\text{O}_3, 7 \text{Na}_2\text{S}_2\text{O}_3, 2 \text{H}_2\text{O}$  (Jochum C. C. 1885, 642).
- (2)  $2 \text{Cu}_2\text{S}_2\text{O}_3, 7 \text{Na}_2\text{S}_2\text{O}_3, 12 \text{H}_2\text{O}$  (Jochum).
- (3)  $\text{Cu}_2\text{S}_2\text{O}_3, 3 \text{Na}_2\text{S}_2\text{O}_3, 2 \text{H}_2\text{O}$  (Rammelsberg Pogg. 56, 321).
- (4)  $\text{Cu}_2\text{S}_2\text{O}_3, 3 \text{Na}_2\text{S}_2\text{O}_3, 6 \text{H}_2\text{O}$  (Jochum).
- (5)  $3 \text{Cu}_2\text{S}_2\text{O}_3, 2 \text{Na}_2\text{S}_2\text{O}_3, 8 \text{H}_2\text{O}$  (Vortmann, M. Ch. 9, 165).
- (6)  $3 \text{Cu}_2\text{S}_2\text{O}_3, 2 \text{Na}_2\text{S}_2\text{O}_3, 5 \text{H}_2\text{O}$  (Lenz. A. 40, 99).
- (7)  $5 \text{Cu}_2\text{S}_2\text{O}_3, 4 \text{Na}_2\text{S}_2\text{O}_3, 8 \text{H}_2\text{O}$  (Jochum).
- (8)  $5 \text{Cu}_2\text{S}_2\text{O}_3, 4 \text{Na}_2\text{S}_2\text{O}_3, 6 \text{H}_2\text{O}$  (Jochum).
- (9)  $\text{Cu}_2\text{S}_2\text{O}_3, \text{Na}_2\text{S}_2\text{O}_3, \text{H}_2\text{O}$  (Russel Ch. Ztg. 9, 233).
- (10)  $\text{Cu}_2\text{S}_2\text{O}_3, \text{Na}_2\text{S}_2\text{O}_3, 3 \text{H}_2\text{O}$  (Vortmann M. Ch. 9, 165).
- (11)  $5 \text{Cu}_2\text{S}_2\text{O}_3, 3 \text{Na}_2\text{S}_2\text{O}_3, 2 \text{Na}_4\text{SO}_4, \text{H}_2\text{O}$  (Jochum).

Cuprous Sodium thiosulphate Cupric Sulphide :—

(1)  $\text{Cu}_2\text{S}_2\text{O}_3 \cdot \text{Na}_2\text{S}_2\text{O}_3 \cdot \text{Cu S} \cdot 4\text{H}_2\text{O}$  (Lenz. A. 40, 99).

(2)  $\text{Cu}_2\text{S}_2\text{O}_3 \cdot \text{Na}_2\text{S}_2\text{O}_3 \cdot 2\text{Cu S}$  (Kessel B. 11, 1585).

Cuprous Sodium thiosulphate Sodium Chloride :—

$3\text{Cu}_2\text{S}_2\text{O}_3 \cdot 2\text{Na}_2\text{S}_2\text{O}_3 \cdot 4\text{Na Cl} \cdot 8\text{H}_2\text{O}$  (Siewert, Zeit. ges. Naturwiss. 26, 486).

Cuprous thiosulphate sodium dithionate :—

(1)  $\text{Cu}_2\text{S}_2\text{O}_3 \cdot 4\text{Na}_2\text{S}_2\text{O}_4 \cdot 4\text{H}_2\text{O}$  (Vortmann).

(2)  $2\text{Cu}_2\text{S}_2\text{O}_3 \cdot \text{Na}_2\text{S}_2\text{O}_4 \cdot 2\text{Na}_2\text{O}$  (Jochum).

See Dictionary of Chemical Solubilities, Inorganic by A. M. Comey, 1896, page 474, and Dammer's Handbook II, 2 pages, 688-89.

The yellow salt to which Lenz and Siewert assigned the formula  $\text{Cu}_2\text{S}_2\text{O}_3 \cdot \text{Na}_2\text{S}_2\text{O}_3 \cdot \text{Cu S} \cdot 4\text{H}_2\text{O}$ , was found by Kessel to have the above composition when prepared at  $10^\circ\text{C}$ , and to vary in composition with variation of temperature. Kessel further noticed that the yellow salt is obtained when the copper sulphate and sodium thiosulphate are mixed in the proportion of one molecule of the former to two molecules of the latter. He further says that the reaction takes place in two stages. According to him the yellow salt is decomposed by cold strong hydrochloric acid forming a white mass which contains neither free sulphur nor copper chloride, is permanent when dry, but in contact with moisture decomposes with separation of copper sulphide and evolution of sulphur dioxide. He is, however, of opinion that the sodium chloride is present as an impurity having had nothing to do with the composition.

Vortmann on the other hand, disagreeing with Kessel describes two salts, one a greenish yellow salt  $\text{Cu}_2\text{S}_2\text{O}_3 \cdot \text{Na}_2\text{S}_2\text{O}_3 \cdot \text{H}_2\text{O}$  and the other an intense citron yellow salt  $3\text{Cu}_2\text{S}_2\text{O}_3 \cdot 2\text{Na}_2\text{S}_2\text{O}_3 \cdot 8\text{H}_2\text{O}$ . The former according to him is obtained in microscopic needles when saturated solutions of copper sulphate and sodium thiosulphate are mixed together in the proportion of one molecule of the former to two molecules of the latter. When, however, the solutions are previously heated to about  $40^\circ\text{C}$  and then mixed together, the temperature of the mixture rises about  $5^\circ$ — $7^\circ$  and the salt with the composition  $3\text{Cu}_2\text{S}_2\text{O}_3 \cdot 2\text{Na}_2\text{S}_2\text{O}_3 \cdot 8\text{H}_2\text{O}$  separates out, also in microscopic needles. The yellow salt is unstable and decomposes thus— $3\text{Cu}_2\text{S}_2\text{O}_3 \cdot 2\text{Na}_2\text{S}_2\text{O}_3 \cdot 8\text{H}_2\text{O} = 3\text{Cu}_2\text{S} + 2\text{Na}_2\text{SO}_4 + \text{H}_2\text{SO}_4 + \text{S}_2 + 2\text{SO}_2 + 7\text{H}_2\text{O}$ .

The salt we are going to describe agrees in some respects with the yellow salt described by Lenz and Siewert and confirmed by Kessel, as also with that described by Vortmann. That there should be copper sulphide present in a salt with such an intense yellow colour seemed to us strange. This led us to analyse the salt once again. To start with,

it was found that the same yellow salt is invariably obtained at all temperatures between 20°C and 34°C provided the green colour of the mixture is not discharged by an excess of sodium thiosulphate. Even with fairly dilute solution, the same salt is obtained. In one or two cases, however, the sodium thiosulphate was so much in excess that the liquor left after the separation of the crystals was yellow. Sometimes the precipitate was allowed to remain in contact with the mother liquor overnight. It may be mentioned here that the salt separates out soon when prepared from concentrated solutions. If, however, dilute solutions are used it takes a much longer time for the salt to crystallise out, but it is richer in colour and more distinct in crystalline structure. In contact with the mother liquor decomposition sets in generally after a day or two, and a dark reddish brown precipitate, more soluble in water than the yellow salt, is formed which finally changes into black insoluble copper sulphide, the supernatant liquid becoming perfectly clear and transparent. In the first few preparations the salt was simply washed with water, in which it seemed to dissolve to a slight extent, until free from sulphuric acid, pressed between filter paper, powdered and dried by exposure to the air. It was found, however, that the salt so treated did not keep well for a few days, decomposition setting in, sometimes, even in course of a few hours. The colour slowly changed to black, and sulphur dioxide was evolved. It was subsequently found that a fairly stable salt could be obtained if it were washed at first with water until free from sulphuric acid and finally repeatedly with rectified spirit over filter pump, dried by exposure to the air, powdered, and carefully sifted in a fine sieve. The salt thus prepared did but lose a triffing when kept in a desiccator over calcium chloride for weeks together. The result of a determination of the loss is given here using about (7) seven grams of the salt.

22nd December, 1896. Platinum basin and salt = 31·2436 grams.

23rd	“	“	“	“	= 31·2425	“
9th	January,	1897.	“	“	= 31·2412	“
26th	“	“	“	“	= 31·2412	“

Thus about 7 grams of the salt lost only 2·5 milligrams in three weeks. This loss may easily be accounted for from a small quantity of alcohol still present in the air dried sample. In connection with the decomposition of this salt at ordinary temperature, it may conveniently be pointed out, here, that more dense the precipitate is and the richer the colour, the better it keeps. Moisture is perhaps the most important factor in bringing about the decomposition, as appears from a little of the above sample, kept sealed in an ordinary glass tube. While the substance kept quite well in a desiccator over calcium chloride for about



a month, the salt in the sealed tube began to change in the course of a few days. It is also important to mention here that the salt does not keep in contact with alcohol as was often noticed during specific gravity determination. Alcohol therefore appears to have a twofold action when used in washing the moist salt. Firstly, owing to its strong affinity for water, it removes easily the last trace of moisture from the salt, and secondly being in itself very volatile entirely disappears when exposed to the air.

A series of analysis was made with samples prepared on different occasions under varying conditions, and the result is tabulated on next page.

From the percentage composition we obtain the following atomic ratio:—

$$\begin{aligned} \text{Cu : Na : S : O} &= \cdot 514 : \cdot 369 : \cdot 874 : 1\cdot 984 \\ &= 1\cdot 4 : 1 : 2\cdot 4 : 5\cdot 5 \\ &= 7 : 5 : 12 : 27\cdot 5 \end{aligned}$$

The composition obtained from the analysis of different samples agree so well among one another that there is no reason to assume it to be a mixture. On the contrary it may fairly be assumed to be a compound with definite composition. It has also been found that different crops of the salt obtained from the same mixture at different intervals have identical composition (see samples B. 1 and B. 2).

On adding caustic soda to a mixture of cupric sulphate and sodium thiosulphate, a blue precipitate is obtained indicating the presence of bivalent copper. If, however, the caustic soda is added after some time when the formation of the yellow salt begins, the yellowish red cuprous hydrate is obtained. On adding caustic soda to the yellow salt suspended in water, the latter is decomposed, and the same reddish yellow cuprous hydrate is obtained. This indicates that the first stage of the reaction consists in the reduction of the cupric copper to cuprous copper, and it is during the second stage that the precipitation of the yellow salt commences. The formation of the yellow salt is neither sudden nor rapid, one or two days being sometimes necessary for complete precipitation. It appears as probable that a portion of the copper in solution undergoes oxidation with the reformation of copper sulphate and reproduction of a blue solution.

The salt thus prepared was subjected to a careful qualitative analysis for all other possible sulphur compounds, as for instance sulphuric acid both free and combined, a sulphide, a sulphite, and the thionates. It was found, however, that none of these compounds are present in the salt even as an impurity. But it gave all the reactions



Dec. 10, 1896	A. 5.	0.5330 0.4862 1.0034 1.1028	... ... 0.4081 ...	... ... 0.2882 ...	... ... 0.1120 ...	... ... 32.45 8.46	... ... ... ...	... ... 27.95 ...	31.74 ... ... ...	... ... 10.16 ...	... ... ... ...	... ... 512 368 .873 ...	... ... 1.98 ...	... ... ... ...	... ... 564 ...
Dec. 12, 1896	A. 6.	0.9262 1.2354	0.3785 0.5050	0.2402 0.3172	... ...	0.0962 ...	32.61 8.4 32.62 8.32	... ...	... ...	10.4 ...	... ...	515 .363 ... ...	... ...	... ...	577 ...
Dec. 22, 1896	A. 7.	0.2095 0.3587 1.4000 0.8469 0.4140 0.6583 0.6106 0.7034 0.4106	... ... 0.5677 0.3433	... ... 0.3648 0.2223	... ... ... ...	1.5636 2.0750	... ... 32.36 8.43 32.26 8.49	... ... ... ...	31.78 31.75	... ...	... ...	... ...	... ...	... ...	... ...
	B. 1.	0.3352 0.2100 0.1738	0.1409 ... ...	0.0883 ... ...	... ... ...	... ... 1.3043	33.54 8.5 ... ...	... ... 27.94	... ... 31.96	... ... ...	... ...	53 .37 .873 ...	... ...	... ...	... ...
	B. 2	0.4794 0.2141	0.1988 ...	... ...	... ...	... ...	33.09 ...	... ...	28.27 31.73	... ...	... ...	... ...	... ...	... ...	... ...
	B. 3	1.0221 0.5626 0.1998 0.7218	0.4158 0.2315 ... ...	0.2672 ... ... ...	... ... 1.1593 1.4898	... ... ... ...	32.46 8.47 32.12 ...	... ... 28.25 ...	... ... 31.7 ...	... ... ... ...	... ...	... ...	... ...	... ...	... ...

Kept overnight with mother liquor, washed first with water and finally with rectified spirit; most stable sample.

Obtained by mixing 100 c. c. copper acetate and 30 c. c. sodium thiosulphate filtered after 20 hours' standing; second crop.

Filtered after 3 hours' settling; First crop.

Collected with 24 hours' settling.

of thiosulphuric acid. Hence it was concluded that the substance was a double thiosulphate of copper and sodium, and we confirmed it by quantitative estimation of the acid. We estimated the thiosulphuric acid both by the direct action of iodine on the salt acidulated with hydrochloric acid, and by decomposing the salt with caustic soda, filtering and titrating the filtrate by iodine after acidification. The results are tabulated below:—

1 c.c. IODINE SOLUTION = 0.1516 GRAM I. = 0.1365 GRAM  $H_2S_2O_3$ .

### A.

*Table of direct titration with iodine solution.*

Wt. of Salt used (Sample VII).	Vol. of Thio-sulphate required.	Vol. of Thio. calculated for 1 gr. Salt.	Mean.	Percentage of $H_2S_2O_3$ .
0.2909 gram.	10.6 c. c.	36.6 c. c.		
0.1880 „	6.9 c. c.	36.7 c. c.	36.63	50
0.3467 „	12.7 c. c.	36.6 c. c.		

### B.

*Table of titration of the filtrate after decomposing the salt by NaOH and filtration.*

Wt. of Salt used.	Vol. of Thio-sulphate required.	Vol. of Thio. calculated for 1 gr. Salt.	Mean.	Percentage of $H_2S_2O_3$ .	
Sample VII. {	1.0637 gram.	38.25 c. c.	36. c. c.	36.2	49.3
	1.5558 „	53.5 c. c.	36.3 c. c.		
0.6190 „	22.0 c. c.	36.3 c. c.			
1.9320 „	67.9 c. c.	35.1 c. c.*			

On comparing the two tables it is found that the result of table A is slightly higher than that of B. The total sulphur 27.95% if calculated as thiosulphuric acid would give 49.8%; so that there is fair agreement between the calculated result and that obtained by the

\* In this case the result is too low as the salt was slightly decomposed and discoloured.

method A. This proves that the whole of the copper is present in the cuprous state, otherwise the iodine required for direct titration would be less, owing to the liberation of iodine by the cupric salt from potassium iodide. The little discrepancy between A and B will be explained later on.

Another important point should be mentioned here in connection with the determination of water. It will be seen on going through the table that when the water is estimated by heating the substance at temperatures up to 250° C. in a current of carbon dioxide and causing the sulphur dioxide evolved to be absorbed by lead dioxide, we get 9·46 % of water. On the other hand when it is heated rather strongly and the evolved sulphur dioxide is absorbed by red hot lead chromate, the result is 10·5 %. It was further noticed that the major portion of the water was liberated before the evolution of any considerable amount of sulphur dioxide began. During the decomposition of the salt a small quantity of sulphuric acid is formed which with the sodium sulphate, another product of decomposition, may form sodium hydrogen sulphate, thus accounting for the increased percentage of water at a very high temperature. We propose to take up the subject in a future communication in connection with the decomposition of the salt.

It may hence be concluded that the substance is a double thio-sulphate of copper and sodium having the formula  $7 \text{Cu}_2\text{S}_2\text{O}_3 \cdot 5 \text{Na}_2\text{S}_2\text{O}_3 \cdot 16 \text{H}_2\text{O}$  with the following percentage composition:—

Copper = 32·24 %.	Sulphur	= 27·95 %.
Sodium = 8·37 %.	Oxygen (for complete oxidation)	= 32·05 %.
Water = 10·48 %.		

The salt with the composition as given above should however take 32·04 % oxygen for complete oxidation of the salt to copper sulphate and sodium sulphate. There seems to be a slight difference between the calculated percentage of oxygen and that obtained as a mean of several analysis. This difference however disappears if the result of the analysis of the last preparation, the most stable in the batch, is considered.

V. Hauer says that an acid cuprous thiosulphate of the formula  $\text{Cu}_2\text{H}_4 (\text{S}_2\text{O}_3)_3$  may be obtained by adding a concentrated solution of copper sulphate to a strong solution of sodium thiosulphate until the colour is deep yellow and gently heating the mixture, as yellow prismatic crystals. We have repeatedly tried to prepare the salt, but as often have we failed. The crystals obtained, invariably contained sodium thiosulphate, and when the heating was carried beyond 35-40°C. the mixture in some cases changed colour from yellow to a dark reddish

brown in the course of a few minutes, and finally deposited a dark-brown precipitate readily soluble in water. If, however, thoroughly saturated solutions of both copper sulphate and sodium thiosulphate, previously heated to about 50-60°C., be used, similar yellow crystalline precipitate is obtained which settles down easily. Care should however be taken in washing the salt, as a comparatively large quantity of sodium sulphate is formed in this case which has to be removed. But the freshly precipitated salt is also sensibly soluble in water. It should therefore be drained as completely as possible, washed once or twice with water and then with dilute alcohol gradually increasing the strength of alcohol and finally with alcohol alone. Different samples have been thus prepared with slight modification in the process, and the result of the analysis of the same are included in the annexed table. On examination it will however be found that although the samples appear to be identical in physical properties, they all differ more or less in composition and that therefore different formulæ should be given to them. (See Table p. 243).

As we had reason to believe that the percentage of sodium in F was a little too high the atomic ratio appears to be as Cu : Na : S : O : H<sub>2</sub>O = 4 : 3 : 7 : 16 : 6 corresponding to the formula 4 Cu<sub>2</sub> S<sub>2</sub> O<sub>3</sub>, 3 Na<sub>2</sub> S<sub>2</sub> O<sub>3</sub> 9 H<sub>2</sub>O. With the following percentage composition:—

$$\begin{array}{ll} \text{Cu} = 31.84 \% & \text{S} = 28.17 \% \\ \text{Na} = 8.68 \% & \text{O} = 32.20 \% \end{array} \quad \text{H}_2\text{O} = 10.2 \%$$

In E the ratio of copper to sodium is as 7 : 6.

By heating therefore with sodium thiosulphate a part of copper is separated, thus increasing the percentage of sodium and sulphur. But whether at any particular temperature a compound of perfect definite composition is formed or not, it is impossible to say positively.

We next proceeded to consider what takes place when copper acetate is used instead of copper sulphate, thinking that acetic acid being a weaker acid might give the normal copper thiosulphate or the acid salt of V. Hauer. Copper acetate is less soluble in water than copper sulphate, and accordingly we had to work with comparatively dilute solutions. Thinking that concentration and relative proportion might produce corresponding difference in composition standard solutions of copper acetate and sodium thiosulphate (1 c.c. Thio. = 10.835.  $\frac{N}{10}$  Thio. = 10.835 × .0248 gms. Thio. = .2687 gms. and 1 c.c. copper acetate = .0182 gms. Cu) were prepared. Kessel and Vortmann state that the yellow salt described by them can only be obtained when the two solutions are mixed in the ratio of one molecule of copper salt to two

Table of analysis of the yellow salt obtained by the action of a strong solution of sodium thiosulphate on a saturated solution of copper sulphate at temperatures from 40°C-70°C.

Date.	Sample.	Weight in grams of substance taken.	Cu <sub>2</sub> S. Weight in grams of	Na <sub>2</sub> SO <sub>4</sub> . Weight in grams of	Ba SO <sub>4</sub> . Weight in grams of	Ag Br. Weight in grams of	H <sub>2</sub> O. Weight in grams of	PERCENTAGE OF					REMARKS.
								Cu.	Na.	S.	O.	H <sub>2</sub> O.	
March 24, 1897, E.		0.9581	0.3738	0.2854	..	..	0.101	31.3	9.51	..	..	10.54	Temperature of preparation 50-60°C. Water determined at 150°-160°C.
		1.2344	0.4788	0.3700	..	..	0.1274	30.95	9.71	..	..	10.33	Water determined at 190°-200°C.
		1.2108	0.4720	0.3634	..	..	0.1260	31.1	9.72	..	..	10.4	Water determined at 235°C.
F. 1.		0.9429	0.3739	0.2603	..	..	Mean.	31.12	9.65	..	..	10.42	Temperature of preparation 60-70°C.
		0.5408	..	..	..	4.0700	..	..	8.96	..	..	..	
		1.1134	..	..	..	..	0.1216	..	..	..	32.04	..	
F. 2.		0.9234	0.3666	..	1.8922	..	..	31.68	..	28.14	..	..	
		0.6232	0.3174	..	1.284	..	..	31.66	..	28.3	..	..	
		0.7960	..	0.2233	..	..	..	..	9.12	..	..	..	
							Mean.	31.61	9.04	28.22	32.04	10.92	

molecules of sodium thiosulphate. It was soon found that no precipitate is obtained when the mixture is made in the ratio of one molecule of the copper salt to two molecules of the sodium salt, and that the same yellow salt is obtained when they are mixed in any other proportion less than the above.

When the yellow salt is treated with a solution of sodium hydrate, an orange coloured precipitate of cuprous hydrate is obtained. If, however, the precipitation is effected in presence of a large volume of water the bright reddish yellow dense precipitate becomes voluminous, turns dirty brown and can easily be filtered. From concentrated solution the whole of the copper cannot be completely precipitated and separated, a portion invariably going into solution. The light brown precipitate after being thoroughly washed, dissolves in dilute hydrochloric acid; a small quantity possessing a black colour however remain undissolved. No sulphur free or combined can be detected in the solution. The insoluble residue can only be dissolved in aqua regia and on analysis was found to contain copper and sulphur only. The residue therefore consists of copper sulphide. It becomes now of importance to decide whether the sulphide is present as such in a soluble form in the original salt or that it is a product of a secondary reaction. We are of opinion that the latter supposition is the correct one and we shall presently give reasons for it.

As already stated the bright orange red precipitate cannot be filtered easily. If, however, the mixture be very gently heated, the precipitate settles down easily and can therefore be filtered readily. Should it however be heated nearly to boiling the precipitate darkens in colour. The residue after careful washing, on treatment with dilute hydrochloric acid leaves a considerably greater quantity of the black copper sulphide than that obtained in the cold. It is therefore clear that the sulphide of copper which is found along with cuprous hydrate is a product of a secondary reaction between sodium thiosulphate and cuprous hydrate. That this is the true explanation of it will be evident from the following consideration. Sodium thiosulphate is neutral to test paper; so also is cuprous hydrate or oxide. But when cuprous oxide is treated with a solution of sodium thiosulphate, a strongly alkaline liquid is obtained even in the cold. According to Field (*Quarterly Journal of the Chemical Society* xvi. 28.) cuprous hydrate dissolves in sodium thiosulphate solution at the ordinary temperature and is reprecipitated on heating. We found, however, that with the application of heat a considerably greater quantity of cuprous hydrate dissolves. To examine this reaction quantitatively weighed quantities of cuprous oxide containing 98.5% of real cuprous oxide were dissolved in excess



of sodium thiosulphate with the application of gentle heat and the sodium hydrate produced was estimated by standard acid, using phenolphthaliene as an indicator. The result is tabulated below:—

Weight of $\text{Cu}_2\text{O}$ used.	Vol. of standard hydrochloric acid used.	Vol. of the standard hydrochloric acid required for 1 gram of the oxide.	Mean.
0·3162 grams.	21·7 c.c.	68·6 c.c.	68·8 c.c.
0·2558 "	17·4 c.c.	68·4 c.c.	
0·2928 "	20·3 c.c.	69·3 c.c.	
0·2539 "	17·5 c.c.	68·92 c.c.	
1·7688 "	121·9 c.c.	68·94 c.c.	

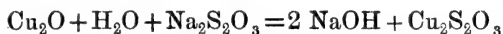
1 c.c. of the standard acid used contained 0·00734 gram of true hydrochloric acid gas.

$\therefore$  0·985 grams of real cuprous oxide liberated a quantity of caustic soda which required 68·8 c.c. of the standard acid or one gram of real cuprous oxide liberates  $\frac{68\cdot8 \times 0\cdot00734 \times 40}{36\cdot5 \times 985} = 0\cdot562$  grams of caustic soda.

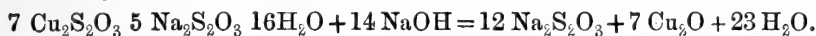
$$\therefore \text{Cu}_2\text{O} : \text{NaOH} :: \frac{1}{142\cdot6} : \frac{0\cdot562}{40} = 701 : 1405$$

$$= 1 : 2$$

or one molecule of  $\text{Cu}_2\text{O}$  liberates two molecules of sodium hydrate according to the following equation:—



The cuprous thiosulphate is kept in solution by the excess of sodium thiosulphate. This solution is very unstable under ordinary circumstances and black copper sulphide soon separates out. Here we have the explanation of the formation of the black sulphide when the yellow salt is treated with caustic soda. The reaction may therefore be represented by the following equation:—



During the first stage of the reaction the whole of the copper is obtained as cuprous oxide, but the bright redish yellow cuprous oxide being in contact with an excess of sodium thiosulphate in course of time gradually darkens in colour and quite rapidly on heating as the result of the other equation stated above, and subsequent conversion of the cuprous thiosulphate into copper sulphide. It is for this reason again copper cannot be precipitated as oxide by means of caustic soda from a solution containing one mol. of copper sulphate to two or more molecules of sodium thiosulphate. Here we have also the explanation

of the little discrepancy noticed between the thiosulphuric acid determined by direct titration (method B) and that obtained from the total sulphur calculated as thiosulphuric acid.

The yellow salt described before dissolves easily in dilute hydrochloric acid without any apparent change. Concentrated hydrochloric acid on the other hand precipitates a white crystalline salt which settles down at once. After a while, however, sulphur dioxide is given off freely from both, and the supernatant liquid turns brown. The white salt if washed immediately with a little water and finally with alcohol is a rather stable one. It can in fact be heated in steam chamber without decomposition. In contact with the mother liquor containing strong hydrochloric acid it decomposes so soon that the washing of the salt becomes difficult and at times impracticable. Besides in presence of a large quantity of strong hydrochloric acid a proportionally large quantity of sodium chloride is precipitated and cannot therefore be completely removed by alcohol. If instead of hydrochloric acid, acetic acid be used, sodium acetate is formed and can be easily removed by washing and filtration with dilute alcohol in which menstruum it is rather freely soluble. We accordingly prepared at first a saturated solution of copper chloride in dilute acetic acid and then gradually added to it a strong solution of sodium thiosulphate, when a perfectly white salt was precipitated. Subsequent experience proved that even acetic acid is not necessary, and the white salt is obtained when a strong solution of sodium thiosulphate is gradually added to an equally strong solution of copper chloride. The precipitate is obtained in fine impalpable powder which settles down easily and can therefore be filtered and washed without any considerable difficulty. The result of the analysis of the different samples is given in the annexed table. From the mean atomic ratio  $\text{Cu} : \text{Na} : \text{S} : \text{Cl} : \text{O} : \text{H}_2\text{O} = 3 : 3.01 : 4.68 : 1.29 : 10.78 : 1.91$  the salt with the formula  $9 \text{Cu}_2\text{S}_2\text{O}_3 \cdot 5 \text{Na}_2\text{S}_2\text{O}_3 \cdot 8 \text{NaCl} \cdot 12 \text{H}_2\text{O}$  is obtained having the following percentage composition:—

$\text{Cu} = 31.46$	$\text{S} = 24.78$	$\text{O} = 28.76$
$\text{Na} = 11.45$	$\text{Cl} = 7.85$	$\text{H}_2\text{O} = 5.97$

If strong solutions of copper sulphate or acetate and sodium thiosulphate be mixed nearly in the proportion of one molecule of the former to two molecules of the latter and allowed to remain for some time as in other cases, no yellow salt separates out. If on the other hand a large excess of concentrated acetic acid be added to the mixture a white or faintly yellowish white precipitate is obtained which is more soluble in water than the yellow salt. Copper acetate should therefore be used in preference to copper sulphate. It can then be washed with

dilute alcohol instead of with water until free from sodium acetate and finished as before. It appears as probable that the acetic acid plays the same part in this case as alcohol does in Vortmann's salts. The white or faintly yellowish white salt turns yellow in contact with water especially if the salt be previously dried. On comparison of the result of analysis of the different preparations as given in the annexed table we find that this salt again is a double thiosulphate of copper and sodium having the formula  $\text{Cu}_2\text{S}_2\text{O}_3 \cdot \text{Na}_2\text{S}_2\text{O}_3 \cdot 2\frac{1}{2} \text{H}_2\text{O}$ . Russel describes (Ch. Ztg. 9233) a salt  $\text{Cu}_2\text{S}_2\text{O}_3 \cdot \text{Na}_2\text{S}_2\text{O}_3 \cdot \text{H}_2\text{O}$  whose properties and method of preparation are altogether different from the one described here. This salt when once perfectly dry, also keeps well even in contact with the atmosphere.

Table of analysis of the white salt obtained by the action

DATE.	Sample.	Weight in grams of substance used.	Weight in grams of $\text{Cu}_2\text{S}$ .	Weight in grams of $\text{N}_2\text{SO}_4$ .	Weight in grams of $\text{BaSO}_4$ .	Weight in grams of $\text{Ag Cl}$ .	Weight in grams of $\text{Ag Br}$ .	Weight in grams of $\text{H}_2\text{O}$ .
Jan. 14, 1897...	D. 1.	0.214	...	...	0.3898	...	...	...
		0.3235	0.1281	0.1175	...	..	...	..
	D. 2.	0.3371	0.1402	...	0.6296	...	...	...
		0.2220	0.0798	..	...	0.061	...	...
	D. 3.	1.1468	0.4592	0.4036	...	...	...	...
		0.7384	...	...	1.3463	...	...	...
		0.8804	0.3516	...	...	...	...	...
		0.4602	...	...	...	...	3.1193	...
		0.5071	...	...	...	0.1527	...	...
		1.6106	...	...	...	...	...	0.0931
		D. 4.	0.9890	0.3869	0.3541	...	...	...
	0.4552		...	...	...	...	3.042	...
	0.8380		...	...	1.5119	...	...	...
	0.7392		...	...	...	0.2352	...	...
	1.5640		0.6160	0.5574	...	...	...	0.0909
	1.5015		...	...	...	..	...	0.0895

of hydrochloric acid (concentrated) on the yellow salt.

PERCENTAGE OF						ATOMIC RATIO OF						REMARKS.	
Cu.	Na.	S.	Cl.	O.	H <sub>2</sub> O.	Cu.	Na.	S.	Cl.	O.	H <sub>2</sub> O		
...	...	25.05	...	...	...	...	...	...	...	...	...	The yellow salt was dissolved in dilute hydrochloric acid and then precipitated by strong hydrochloric acid and washed with alcohol.	
31.53	11.75	...	...	...	...	3.00	3.06	4.7	...	...	...		
32.99	...	25.65	...	...	...	...	...	...	...	...	...	The result is high owing to the salt being slightly decomposed.	
32.2	...	...	6.8	...	...	...	...	...	...	...	...		
32.08	11.4	...	...	...	...	...	...	...	...	...	...	Deducting the weight of Ag Cl.	
...	...	25.06	...	...	...	...	...	...	...	...	...		
32.09	...	...	...	...	...	3.0	2.93	4.63	1.24	10.77	1.9		
...	...	...	...	28.86	...	...	...	...	...	...	...		
...	...	...	7.45	...	...	...	...	...	...	...	...		
...	...	...	...	...	5.78	...	...	...	...	...	...		
31.19	11.6	...	...	...	...	...	...	...	...	...	...		Perfectly white sample. Deducting the weight of Ag Cl.
...	...	...	...	28.45	...	3.0	3.05	4.7	1.34	10.78	1.93		
...	...	24.8	...	...	...	...	...	...	...	...	...		
...	...	...	7.87	...	...	...	...	...	...	...	...		
31.43	11.55	...	...	...	5.81	...	...	...	...	...	...		
...	...	...	...	...	5.96	...	...	...	...	...	...		
					Mean	3.0	3.01	4.68	1.29	10.78	1.91		

*Table of analysis of salt obtained by the addition of strong acetic acid to a mixture of sodium Thiosulphate and copper acetate solutions.*

DATE.	Sample.	Weight in grams of substance taken.	Weight in grams of $\text{CuS}$ .	Weight in grams of $\text{Na}_2\text{SO}_4$ .	Weight in grams of $\text{BaSO}_4$ .	Weight in grams of Ag Br.	Weight in grams of $\text{H}_2\text{O}$ .	PERCENTAGE OF					ATOMIC RATIO OF				REMARKS.	
								Cu.	Na.	S.	O.	$\text{H}_2\text{O}$ .	Cu.	Na.	S.	O.		$\text{H}_2\text{O}$ .
Feb. 22, 1897...	C. 1.	0.4312	0.1573	0.1444	..	..	..	..	..	..	..	..	..	..	..	..	..	The little discrepancy in the atomic ratio was due to the presence of a small quantity of sodium salt not thoroughly washed out.
		0.2162	0.0786	..	0.4634	..	..	29.46	..	..	..	1	2	4.5	..	..	..	
		0.1862	..	..	..	..	1.4224	..	..	32.5	..	..	..	..	..	..	..	
		0.6218	0.2145	0.2104	..	..	..	..	..	..	..	..	..	..	..	..	..	
		0.5491	0.1927	..	1.1628	..	..	..	29.49	..	..	..	1	1.07	2.09	4.54	1.29	
		0.2156	..	..	..	..	1.6103	..	..	31.8	..	..	..	..	..	..	..	
	1.067	0.3712	0.3588	..	..	..	0.1098	27.76	10.89	..	..	10.29	..	..	..	..		

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*An Annotated List of the Butterflies of the Ké Isles.*—By LIONEL DE NICÉVILLE, F.E.S., C.M.Z.S., &c., and HEINRICH KÜHN.

(With Plate I.)

[Received November 25th, 1897; Read January 5th, 1898.]

The Ké, Key, or Kei Isles,\* called by the natives the Evar Isles, have a total area of about 680 square miles, and have been in the possession of the Dutch since A.D. 1645. They lie south of the equator, also to the south of Dutch New Guinea, to the south-east of the large island of Ceram and the nearer small Banda group of isles, to the west of the Aru group of isles, and to the north of the Timor Laut or Tenimber Islands. They are placed between  $5^{\circ} 0' - 6^{\circ} 5' S.$  Lat. and  $131^{\circ} 50' - 133^{\circ} 15' E.$  Long. They may be divided into four parts:—I. Great Ké Isle or Noehoe Ioet, II. Little Ké or Noehoe Roa, III. the Tiandoe islets, IV. the Koer islets. The last, according to Professor K. Martin, formed once a part of the eastern extension of the continent of Asia, while the first three appertain to the Australian region. Great Ké has a tertiary formation, consisting of limestone rocks; the surface is hilly, rising to nearly 3,000 ft. elevation. Little Ké and the other islands are all of coral formation, and are post-tertiary or quaternary. Wherever the soil and situation are favourable, the islands are planted with cocoa-nut and bread-fruit trees. The islands to the south of Little Ké are from the evidence of the rocks of an older formation of the quaternary period. All the

\* Pronounced "kay," or exactly as the letter "K," says Dr. A. R. Wallace in "The Malay Archipelago."

islands shew in different places distinct old strand and beach lines, which prove that they have been periodically raised by volcanic action. According to the natives, about sixty years ago one small island was so raised above the level of the sea on the western side during the occurrence of a great earthquake combined with a tidal wave. Also during recent years slight earthquakes are felt from time to time. On Little Ké is found the largest area under cultivation, "batatas," a kind of pea, and also beans, indian-corn and cocoa-nuts being largely grown. In some places in Little Ké are yet found forests of iron-wood, "linggoo-ah" and "loriah" wood; also on the mountains of Great Ké. But the forests are being cut down year by year, and become rapidly thinner, the more so as the Ké islanders every year increase the building of "praus" (native boats), which are sold to the people of the islands close to the Ké archipelago. The natives live principally on sago, which is largely cultivated; but rice has to be imported by traders. The exports from the Ké isles consist of logs of iron-wood; "praus," "tripang" (*bêche-de-mer*), turtle-shell, black-shell, green snail-shell, "copra" (dried cocoa-nuts), and some "bengkoedoe" (*Morinda bracteata*, Roxb.), used for dyeing. The whole population consists of about 24,000 souls, residing chiefly on Great Ké, of whom about 14,000 are heathens, 9,500 Muhammadans, and about 500 Roman Catholics, the latter resulting from a mission settled there for about the last ten years. The people are of very mixed blood, and are Malaio-Polynesians. Their colour varies from light to dark brown and is of all shades. The hair is black, mostly long and slightly curly. There are of course many with short frizzly hair descended from immigrants from New Guinea. They divide themselves into four classes:— I. The "mel-mel" are the aristocracy, and are chiefly descended from immigrated traders from Ternate, Luang, Ceram, and Macassar in Celebes. From this class are mostly elected the chiefs, of whom there are usually three or four in each village. II. The "jam-ah," who are perhaps the original native aristocracy, of whom also different chiefs exist. III. The "renn-renn," who are free citizens. IV. The "tri-ri" or slaves, or better, bondsmen. Though there are so many chiefs, they have very little authority over their people, the family being the unit of government. The religion of the heathen portion of the population is a very simple one. They have one or two wooden idols erected in places they consider to be sacred, but believe much more in ghosts than in their gods; to the former they pray, and make offerings to them when commencing the cultivation of their fields, going a journey, in times of distress, &c. In general the people are very lazy, and live from hand to mouth, never thinking of the morrow. A little sago and a fish suffices for each meal, and of fish there is



an abundance in the sea for the trouble of catching. If they want a new cloth they can obtain it without trouble on credit from the numerous traders, paying for it hereafter with "copra," "tripang," &c. The Ké people consider themselves to be very courageous, but are in reality cowardly. In the old days before the Dutch took over the government of the islands, the natives were often fighting amongst themselves. These little wars, often extending over a considerable period, came to an end at last when one side or the other had killed a few of their enemies, seldom more than four or five. Under enemies, women and children were included as well as men. The tribe or village losing the fight and coming to the conclusion that peace was desirable, made terms with the opposite side, and paid a war indemnity, sometimes in land, but usually in old cannon ("lilas"), rifles, gongs ("tom-toms"), bracelets and chains of gold, plates, &c., &c.

The islands being very small have also a very poor fauna. The mammals consist of wild pigs, two species of *Cuscus*, a flying squirrel, a flying fox, some species of bats, rats and mice. On Great Ké a kangaroo and a marsupial badger are found. Birds are more common, but no paradise-birds occur.

The west monsoon blows from December till April, which is the wet-season; the east monsoon also from May to November brings much rain, alternating with fine clear days. The driest months are from July to November. The mean humidity of the atmosphere of the Ké Isles is 88.5%, and the mean temperature is 80.9° F. (27.4 Cels.), according to the observations of Myuheer H. C. W. Plauten, an officer of the Dutch navy.

Great Ké possesses many small rivers, which form here and there beautiful waterfalls in their course from the mountains to the sea. In the east monsoon they are usually dry. On Little Ké, in which there are no hills, there is only one river, which is about a mile and a half long, but which has an outflow of about two cubic meters a second, and what is most strange, has a greater flow of water in the dry- than in the wet-season, no doubt from springs at its source or in its course. Besides the rivers there are in Great Ké one and in Little Ké two small lakes, which have no outlet, and seem to be merely accumulations of rainfall in natural depressions in the ground.

From what has been said above, it will be understood that the entomological fauna of the Ké archipelago is poor, but strangely enough (at any rate as far as the butterflies are concerned) it has more distinct endemic species than some of the neighbouring islands which are larger. For instance, three out of the six known species of *Euplexa* found on the islands are endemic to them, and three of them are very unusually-

coloured animals, being more or less pure white on the upperside in both sexes, and are mimicked by the females of two peculiar species of *Hypolimnas* (*H. polymena*, Felder, and *H. hewitsoni*, Wallace). H. M. S. "Challenger" in her memorable scientific expedition round the world, called at Ké Dulan, and Dr. A. G. Butler, in *Ann. and Mag. of Nat. Hist.*, fifth series, vol. xiii, p. 188 (1884), enumerates thirteen species of Butterflies from thence obtained on that occasion, all of which are noted below. The late Herr C. Ribbe in his paper on the Butterflies of Great Ceram (*Iris*, vol. ii, p. 187 (1889), mentions many species from the Ké Isles, all of which are referred to herein. Herr J. Röber of Dresden in *Tijd. voor Ent.*, vol. xxxiv, pp. 261–334 (1891), vol. xxxv, pp. 85, 86, pls. iii–vi (1892), has written a most interesting paper on the *Lepidoptera* of the group of Malayan islands which include Ceram, Goram, Maumerie, Key, Flores, Letti, Alor, Luang, Bonerate, Timor, Timor Laut, Kisser, Wetter, and Tanah Djampea, recording 42 (not 41 as stated at page 262) species from the Ké Archipelago. All these are mentioned below, and those not seen by us have a \* prefixed to their names. The present paper is based on materials obtained by Kühn during the nine years (from 1889) he has resided on the islands, and he has written the introduction and notes on the habits of the various species, while de Nicéville is responsible for the rest of the paper, and has seen it through the press. It is probable that the list is fairly complete, there are probably only a very few small species left to be recorded. We record 128 species from the Archipelago, out of which we have not seen only 17; of these latter most of the names are doubtless incorrect identifications, and appear in our list under other names.

### Family NYMPHALIDÆ.

#### Subfamily DANAINÆ.

##### 1. HESTIA (*Nectaria*) D'URVILLEI, Boisduval.

In Great Ké this species is usually seen flying in the forest at a great height amongst the trees. It is very rare in Little Ké.

##### 2. DANAIIS (*Tirumala*) HAMATA, Macleay.

Very seldom seen in Little and Great Ké, common on Koer Isle. De Nicéville finds it difficult to distinguish *D. septentrionis*, Butler, from this species. Macleay's species is much the older.

##### 3. DANAIIS (*Limnas*) PETILIA, Stoll.

Key, Röber, as *Danaus chrysippus*, Linnæus. The Ké Isles examples agree with those from Australia. It is very rare on all the islands.

4. DANAIS (*Salatura*) LARATENSIS, Butler.

Röber as *Danaus plexippus*, Linnæus. Originally described from Larat in the Timor Laut Islands. Single specimens are seen everywhere on Great and Little Ké Islands all the year round, mostly on open spots covered with "alang-alang" grass (*Imperata arundinacea*, Cyrill.).

In de Nicéville's collection is an old male specimen of *D. intensa*, Moore, described from Java, Lombok and Borneo. As the species is unknown to Kühn, and is represented by *D. laratensis* in the Ké Isles, it is probable that the specimen did not come from the Ké Isles.

5. DANAIS (*Salatura*) AFFINIS, Fabricius.

Key (*Röber*), Ké Dulan (*Butler*). Very common on all the islands.

6. DANAIS (*Asthipa*) CITRINA, Felder.

Röber as *Danaus gloriola*, Butler. Common on Great and Little Ké Islands amongst bamboo clumps. Mr. Kirby has given some notes on this species in *Ann. and Mag. of Nat. Hist.*, sixth series, vol. iv, p. 157 (1889), but they are difficult to follow without seeing the specimens about which he wrote.

## 7. TELLERVO ZOILUS, Fabricius.

Röber as *Hamadryas nais*, Guérin. Butler as *H. niveipicta*, Butler, *Ann. and Mag. of Nat. Hist.*, fifth series, vol. xiii, p. 191, n. 6 (1884), from Ké Dulan. This "new species" hardly seems to differ from *T. zoilus*. Common everywhere in the bush in all the islands. The male secondary sexual characters in the genus *Tellervo* (= *Hamadryas*, Boisduval, nec *Hamadryas*, Hübnér) do not appear to have been described. They are found in the forewing, and consist of a greater sinuosity of the inner margin than in the female; with a large clump on the upper surface of modified dull (instead of intensely black like the rest of the ground-colour) black scales from the inner margin commencing at the base of the wing but not reaching the outer margin, and extending forwards as far as the first median interspace, these modified scales being entirely absent in the female.

8. EUPLŒA (*Vadebra*) EURYPON, Hewitson.

Moore. Röber. Ké Dulan (*Butler*). Common on all the islands in October and November, but single specimens are found all the year round. Mr. F. Moore in his monograph of the subfamily (*Proc. Zool. Soc. Lond.*, 1883, p. 284, n. 2) places this species in his genus *Chirosa*, in which

he is followed by Dr. Butler in 1884 and by Col. C. Swinhoe (*Journ. Linn. Soc. Lond., Zoology*, vol. xxv, p. 342 (1896), that genus coming into Mr. Moore's second section of the *Euplœina* with "One 'sexual mark' or scent-producing organ on the forewing." *E. eurypus* has no male secondary sexual characters whatever, and therefore comes into Mr. Moore's first section "No 'sexual mark' or scent-producing organ on the forewing," and seems to fall best into the subgenus *Vadebra*.

9. *EUPLŒA (Chanapa) SACERDOS*, Butler.

Originally described from Larat in the Timor Laut Islands. Dr. Butler says that the discal series of white spots on the hindwing are not [posteriorly] notched, but in some of our specimens though not in others as many as five are occasionally notched. The species is very common on the Tiandoe and Koer islets, but only two specimens have been taken on Great Ké, and none on Little Ké.

10. *EUPLŒA CALLITHOË*, Boisduval.

Mr. Moore in his Monograph of the *Euplœina*, p. 305, places this species under the genus *Salpina*, but according to our specimens and Dr. O. Staudinger's figure of the male from New Guinea in *Iris*, vol. viii, p. 159, pl. iv, fig. 1, *male* (1895), it is a true *Euplœa*. It occurs only on Great Ké, never found on Little Ké or the adjoining islets.

11. *EUPLŒA (Calliplœa) HOPFFERI*, Felder.

Röber. This species has been figured by Col. Swinhoe in *Journ. Linn. Soc. Lond., Zoology*, p. 342, pl. xvi, fig. 1, *male* (1896). Found on all the islands everywhere. It is the rarest species of the genus, except the species which next precedes.

12. *EUPLŒA (Calliplœa) VISENDA*, Butler.

Originally described from Maroe Island of the Timor Laut group. Found in the Ké Islands group only on Tiandoe and Koer, where it is very common and extremely variable in the size and extent of the white markings, no two specimens being exactly alike. Some specimens are very small, perhaps the smallest in the genus, expanding only 2.0 inches in alar expanse.

13. *EUPLŒA (Hirdapa) ASSIMILATA*, Felder. Plate I, Fig. 1, *larva*.

Moore as *H. fraterna* Felder, from Ké Island. Röber. Butler as *H. fraterna*, from Ké Dulan. This species was originally described from the "Arru Islands," while *E. fraterna*, Felder, was described from a female only from the same islands, on the same page. Probably the

two species are really one. It is very common on nearly all the islands of the Ké group, but it seems rare on Koer. Mr. Kühn has bred it. The larva is black; each segment bears several yellow stripes, the first of which extends lower than the others and encloses the black spiracle. The head, abdomen and legs are entirely black. The body bears four pairs of long fleshy subdorsal tentacles tapering to a point, each is basally carmine-red, becoming black towards the apex, the first pair is placed between segments two and three, the second between three and four, the third between four and five, the fourth between ten and eleven. The pupa is greenish and metallic.

The *Euplœas* of the Ké Archipelago are very interesting, and form four distinct groups as regards coloration and markings:—I, *E. eurypus*, Hewitson, *E. hopfferi*, Felder, and *E. assimolata*, Felder, which are mimicked by the females of *Hypolimnas polymena*, Felder, and *H. hewitsoni*, Wallace; II, *E. sacerdos*, Butler; III, *E. callithoë*, Boisduval; IV, *E. visinda*, Butler.

#### Subfamily SATYRINÆ.

##### 14. MYCALESIS (*Calysime*) PERSEUS, Fabricius.

Occurs on Great and Little Ké in fields of "alang-alang" grass, but is not common. The ocellated wet-season form appears to be the only one found on the islands. In both sexes the ocellus in the first median interspace of the forewing on the upperside has a small pure white pupil.

##### 15. MYCALESIS (*Mydosama*) SIRIUS, Fabricius.

Little and Great Ké Isles. Much rarer than the preceding species. "*Satyris*" *manipa*, Boisduval, and *Mycalesis daidis*, Hewitson, are synonyms.

##### 16. YPTHEMA ARCTOUS, Fabricius.

Röber. Occurs commonly everywhere on all the islands, and frequents meadows.

##### 17. HIPIO CONSTANTIA, Cramer.

Röber and Ribbe as *Melanitis crameri*, Butler, described from New Britain, equals "*Cyllo*" *amabilis*, Boisduval, from New Ireland. The type of the genus *Hipio* of Hübner is the present species. It is doubtfully distinct from the genus *Melanitis*, Fabricius. *H. constantia* is rather rare in all the islands, keeping chiefly to bamboo and sago scrub. Colonel Swinhoe has described a single male of this species from "Ké

Island" as *M. gylippa* in Ann. and Mag. of Nat. Hist., sixth series, vol. xii, p. 255 (1893), collected by Halliburton. Swinhoe does not refer to *H. constantia* in his description. Our females from the Ké Isles agree very well with Cramer's original figure of that sex, which was described from the Molucca Isles.

Subfamily ELYMNIINÆ.

18. ELYMNIAS (*Dyctis*) MELANE, Hewitson.

Rare on all the islands, usually seen flying about swampy places in the jungle.

Subfamily NYMPHALINÆ.

19. CUPHA CRAMERI, Felder.

Common everywhere on Little Ké, but more so in forests than elsewhere, flying close to the ground between low bushes. Our specimens agree fairly well with Cramer's figures of this species from Amboina in Pap. Ex., vol. ii, pl. cxlviii, figs. D, D (F, F in text), *male* (1777), as "*Papilio*" *lampetia*. Dr. Aurivillius says that these figures equal the "*Messaras*" *crameri* of Felder, nec "*Papilio*" *lampetia* of Linnæus, as indeed was pointed out by Dr. Felder when renaming Cramer's figures.

20. ATELLA EGISTA, Cramer.

From Little and Great Ké. Flies high and is seldom caught; keeps to the tops of bushes.

21. CETHOSIA CYDALIMA, Felder. Plate I, Figs. 2, *larva*; 2a, *head of larva*; 2b, 2c, *pupa*.

Röber. Ké Dulan, Butler, as *C. insulata*, Butler. Ribbe as *C. cydippe*, Linnæus, var. *damasippe*, Felder. Dr. Butler in Cist. Ent., vol. i, p. 165, n. 37 (1873), described *C. insulata* from Ké Island. He does not give the sex of the types. It is probably the same as *C. cydalima*, originally described from the Arru Islands. The species on Little and Great Ké is not common, but is less rare at the beginning and end of the wet than at other seasons. Mr. Kühn has bred it, the larva being of the usual form, with six compound black spines on each segment, the dorsal pair twice as long as the two lateral pairs; the ground-colour of the larva deep black, each segment posteriorly with a pair of sulphur-yellow bands reaching below the spiracles. The pupa is whitish, clouded with pale brown, with four pairs of golden spots on the dorsum.

22. CETHOSIA LAMARCKII, Godart.

Occurs only on Tiandoe and Koer Islets, not found on Great and Little Ké Isles.

23. CYNTHIA CYCNIA, de Nicéville.

*C. cynia*, de Nicéville, Journ. A. S. B., vol. lxvi, pt. 2, p. 547, n. 4, pl. iii, figs. 19, male; 20, female (1897).

Little and Great Ké. Single specimens are occasionally caught on flowers.

24. PRECIS IDA, Cramer.

Röber. Very common on all the islands all the year round.

25. PRECIS ZELIMA, Fabricius.

Kühn has sent one male specimen of this species to de Nicéville. In the collection of the latter are several examples of both sexes from Mackay in North Australia, with which the one from the Ké Isles agrees exactly. The species may be known from *P. ida*, Cramer, by having on the underside of the hindwing a decreasing series of two, three, or four creamy-white spots commencing on the middle of the costa posterior to the costal nervure. It is a little doubtful in de Nicéville's opinion if this character is really of specific value, as in the common *P. iphita*, Cramer, of India, the same variation is of frequent occurrence.

26. JUNONIA EXPANSA, Butler.

*Precis expansa*, Butler, Proc. Zool. Soc. Lond., 1883, p. 367, n. 5.

Röber as *J. erigone*, Cramer. Described from females from Larat in the Timor Laut Islands. In the Ké Isles it is rather variable, the tone of the ground-colour of both wings on both surfaces being much darker in some specimens than in others. The male is much darker coloured than the female, especially so on the underside. In Little and Great Ké it is very common all the year round.

27. \*JUNONIA ORITHYIA, Linnæus.

Röber as *J. orithya* [sic!]. This is we think a very doubtful record; at any rate it will not be the typical form of the species which is found in the Ké Isles.

28. JUNONIA VILLIDA, Fabricius.

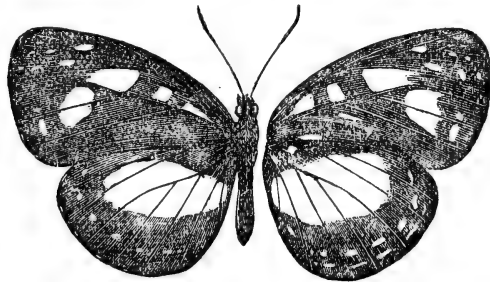
Very rare on Little and Great Ké.

29. \**JUNONIA TIMORENSIS*, Wallace.

Ké Dulan (*Butler*). We have not seen this species from the Ké Isles.

30. *NEPTIS (Rahinda) CONSIMILIS*, Boisduval. Plate I, Figs. 3, *young larva on food-plant*; 3a, *full-grown larva*.

Not very rare on Little and Great Ké, single specimens being here and there met with. Mr. Kühn has bred this butterfly. The ovum is laid singly on the underside of the leaves of a papilionaceous shrub, it is shaped like a raspberry, is pale yellow, and slightly hairy, and furnished with raised knobs or tubercles in seven rows, the largest row having 14 tubercles. Larva dark olive-brown, shagreened; head bifurcated in the dorsal line; the second, third and fifth segments furnished with a pair of processes, the pair on the third segment the longest; there is a pale dorsal line from the third to the thirteenth segment, and a similar spiracular line. For protection against its enemies the larva has developed the following curious habits:—It bites half through the middle of one of the bipennate leaves of its food-plant, which is probably a species of *Acacia*, and also bites through entirely the small leaves at the end of the stem beyond the half-bitten-through part, but fixes each of these bitten-off leaves to the stem by a thread. The larva rests on the underside at the extreme end of the stem, which has bent over at a right-angle from the unbitten portion, and feeds on the faded, dried-up, brown leaves, which very quickly become of the same shade of colour as the larva. When touched, the larva shakes the leaves. The larva is very sluggish, and moves very slowly, step by step.

31. *NEPTIS LACTARIA*, Butler.

*Athyma lactaria*, Butler, Ann. and Mag. of Nat. Hist., third series, vol. xvii, 98, n. 1 (1866); *Neptis lactaria*, de Nicéville, Journ. A. S. B., vol. lxvi, pt. 2, p. 535, n. 2, woodcut of female (1897).

Rare on Little and Great Ké Isles.



32. NEPTIS (*Phædyma*) NECTENS, de Nicéville.

*N. (Phædyma) nectens*, de Nicéville, Journ. A. S. B., vol. lxvi, pt. 2, p. 548, n. 6, pl. i, fig. 3, *female* (1897).

Very rare on Little and Great Ké, not known from the other islands.

33. \*NEPTIS VENILIA, Linnæus.

Ribbe records this species from the Key Isles as "*Athyma*" *venilia*, but we have never seen it from thence.

34. HYPOLIMNAS BOLINA, Linnæus.

Röber. Common in December and January on all the islands, but single specimens are met with all the year round. The form of the female occurring in the islands is that called *Papilio iphigenia* by Cramer, Pap. Ex., pl. lxvii, figs. D, E (1775), from Batavia in Java. The male is normal.

35. HYPOLIMNAS POLYMENA, Felder.

Röber as *H. alimena*, Linnæus, var. *heteromorpha*, Röber. The male of this species is typical *H. alimena*, Linnæus, but the female, which gives its name to the species, has been named *H. polymena* by Felder, from the Arru Isles, and *H. heteromorpha* by Röber. It is a mimic of *Euploea assimidata*, Felder, and the other two similarly coloured *Euploea*s found in the Ké Archipelago. It is common in the wet season, and has been figured by Swinhoe in Journ. Linn. Soc. Lond., Zoology, vol. xxv, p. 342, pl. xvi, fig. 2, *female* (1896).

36. HYPOLIMNAS HEWITSONI, Wallace.

Apparently rare in the Ké Archipelago, Kühn having only obtained three or four worn male specimens on Tiandoe. Both sexes of this fine species were described and figured from the Ké Islands by Hewitson in Proc. Zool. Soc. Lond., 1858, p. 464, pl. liv, figs. 2, *male*; 1, *female*, as *Diadema pandarus*, Linnæus, and Wallace in Trans. Ent. Soc. Lond., 1869, p. 282, n. 8, named it *Diadema hewitsoni* from the same place. The female, which we have not seen, is heavily marked with white on both wings on the upperside, and doubtless mimics the three similarly marked species of *Euploea*s found on the Ké Isles.

37. PARTHENOS BRUNNEA, Staudinger.

Röber. This is quite distinct from *P. sylvia*, Cramer, from Java, and *P. salentia*, Hopffer, from Celebes. Single specimens on Little Ké and Great Ké are found all the year round.

38. *EUTHALIA (Lexias) ÆROPUS*, Linnæus.

Ribbe as *Symphædra aeropa*. Occurs only on Great Ké on the tops of hills, and is very rare. Not found on Little Ké Island.

39. *SALAMIS SABINA*, Cramer.

Sometimes rare, at other times common, on all the islands.

40. *DOLESCHALLIA AUSTRALIS*, Felder.

Ké Dulan (*Butler*). At times scarce, sometimes common, on Little and Great Ké Islands.

41. *DOLESCHALLIA POLIBETE*, Cramer.

Commoner than the preceding species on Little Ké and Great Ké Isles. It is very interesting that two such distinct species should be found together on one small group of islands. *D. polibete* appears to be found in the Himalayas, Assam, Burma, South India, Ceylon, the Andaman and Nicobar Islands, and again in Lombok, Amboina, and the Ké Islands. It was originally described by Cramer from Amboina in Pap. Ex., vol. iii, pl. ccxxxiv, figs. D, E, *female* (1779); Cramer's figure under the same name on pl. ccxxxv, figs. C, D, *male*, also from Amboina, has been named *D. crameri* by Distant in Ent. Month. Mag., vol. xxii, p. 41 (1885), and is a quite distinct species. The Lombok, Amboina and Ké Islands form differs from the form from the other localities named above as *D. polibete* in having the four subapical white dots on the forewing much more strongly developed, the more western form having them more feebly developed and sometimes entirely absent, but this solitary character is one on which it is hardly sufficient to base a distinct species. *D. bisaltide*, Cramer, and *D. pratipa*, Felder, seem to be one species, which is found in the Malay Peninsula, Sumatra, Nias, Java, Bawean, Borneo, Bali, Lombok and the Philippines.

42. *CHARAXES KEIANUS*, Rothschild. Plate I, Figs. 4, 4a, 4b, *pupa*.

*C. pyrrhus keianus*, Rothschild, Nov. Zool., vol. iv, p. 508, n. 2 (1898).

A rare butterfly on Little and Great Ké Islands. Mr. Kühn has bred the larva, which feeds on *Albizzia* sp., and also *Mesua ferrea* (Ironwood). The pupa is of the usual shape, very broad, rounded, smooth, with some small knobs only round the cremaster. In colour it is pale green, with snow white stripes and dashes. This species is described by de Nicéville in Journ. Bomb. Nat. Hist. Soc., vol. xii, p. , n. 8, pl. Z, figs. 13, *male*; 14, *female* (1898). When describing it de Nicéville did not know that it would subsequently be named by the Hon. Walter Rothschild.

## Family LEMONIIDÆ.

## Subfamily LIBYTHEINÆ.

## 43. LIBYTHEA ANTIPODA, Boisduval.

Herr Kühn has taken a single specimen of this species, and saw one other. The identification is his, de Nicéville has none from the Ké Archipelago.

## Family LYCÆNIDÆ.

## 44. GERYDUS ACRAGAS, Doherty.

Not very rare in Little Ké Island. Most frequently caught on the young leaves of a species of *Sambucus* at rest amongst black ants, the butterfly as well as the ants probably feeding on the sap of the leaf-buds. The male has a small oval whitish patch surrounding the swollen base of the third median nervule on the upperside of the forewing; no other markings whatever on the upperside. The female has the markings on the upperside exactly as described for the species by Doherty. Both sexes on the underside of the forewing have the markings exactly as described by Mr. H. H. Druce in Proc. Zool. Soc. Lond., 1895, p. 561, pl. xxxi, figs. 9, *male*; 10, *female*, for *G. vincula* from Borneo. Doherty unfortunately does not say if the submarginal band of confluent markings extends from the apex to the outer angle or not. *G. vincula* differs from *G. acragas* in the female being uniformly dull brown without markings on the upperside of the forewing. The "*Miletus*" *chinensis*, var. *ceramensis*, Ribbe, from South and East Celebes, Amboina, Saigun, Buru and Borneo (Iris, vol. ii, p. 247, n. 95, pl. v (nec i), fig. 2, *female* (1889), appears to be quite the same as *Geryden acragas*, and has two years' priority.

## 45. PITHECOPS BASSARIS, de Nicéville.

*P. bassaris*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vii, p. 327, n. 4, pl. H, figs. 4, *male*; 5, *female* (1892).

Röber as *Eupsychellus* (n. g.) *dionisius*, Boisduval. Ribbe as *Plebejus dionysius*, Boisduval. It is found commonly on Little and Great Ké Islands during the wet season on roads and paths through swampy bush country. The genus *Eupsychellus* is a synonym of *Pithecopis*.

## 46. \*NEOPITHECOPS ZALMORA, Röber.

*Plebeius lucifer*, Röber, Iris, vol. i, p. 61, pl. iv, fig. 5 (1886).

Not seen from the Ké Isles by us. It was described from the Aru and Key Islands as *P. lucifer* by Röber. Herr Röber kindly sent

de Nicéville a specimen of this species named by himself from the Aru Isles, which enables de Nicéville to say confidently that *Plebeius lucifer* is a synonym of *Neopithecopis zalmora*. In vol. ii of Dr. O. Staudinger's and Dr. E. Schatz's *Exotische Schmetterlinge*, p. 273, n. 32, pl. xlvi (1892), reference is made to Herr Röber's genus *Papua*, the type of which is based on *Plebeius lucifer*. Consequently *Papua* falls to *Neopithecopis*.

47. MEGISBA MALAYA, Horsfield.

Mr. de Nicéville has seen four specimens only from the Ké Isles of this widely distributed species, none of which have tails. It keeps chiefly to the tops of fruit trees, and is apparently rare, but is probably less often seen than it would be if larger, brighter coloured, or haunting lower stations. It occurs only as far as is known on Little Ké Island of the Ké Archipelago.

48. CYANIRIS KUEHNI, Röber.

*Plebeius kühni*, Röber, *Iris*, vol. i, p. 60, pl. iv, fig. 29, male (1886).

Described by Röber from East Celebes and the Key Islands. It is very close to the widely-spread *C. puspa*, Horsfield. Especially found on Little but also on Great Ké Island. It is partial to the flowers of *Leguminosæ*.

49. \*CYANIRIS CAGAYA, Felder.

Röber as *Plebeius cagaya*. We doubt the occurrence of two distinct species of *Cyaniris* in the Ké Islands. *C. cagaya* was described from the Philippine Isles.

50. ZIZERA OTIS, Fabricius.

Common on Little and Great Ké Isles on roads and paths flying amongst the grass and low-growing herbs.

51. ZIZERA GAIKA, Trimen.

Very rare, found only on Little Ké, though probably often overlooked. It is the smallest butterfly found in the islands, some of our specimens expanding only .6 of an inch.

52. "PLEBEIUS" TUALENSIS, Röber.

*P. tualensis*, Röber, *Iris*, vol. i, p. 61, pl. v, fig. 26 (1886).

Originally described from the Key Islands, where it is very rare on Little and Great Ké, and usually caught on flowers of the *Leguminosæ*. The male on the upperside is coloured like a typical species

of the genus *Nacaduba*, being dark dull purple, with a narrow external black border. The female on the upperside is dull plumbeous, not dull purple like the male. The markings on the underside are more similar to those of the genus *Zizera* than to those of any other genus known to us. It has no tails. The neuration differs from both the above-named genera in that the first subcostal nervule is entirely separated from the costal nervure in the forewing. It has a near relation in "*Lycæna*" *mærens*, Rosenstock, from tropical Northern Australia, but the male of that species has the wings narrower, the apex of the forewing more acute, and the outer margin straighter, the ground-colour of both wings on the underside darker, and all the markings consequently less prominent. *Lycæna mærens* has been placed by Messrs. Anderson and Spry in "Victorian Butterflies," p. 92, woodcut of male (1894), in the genus *Holochila*.

### 53. PSEUDODIPSAS ILIAS, Felder.

Decidedly rare on Little and Great Ké Isles. Our specimens agree very well with "*Holochila*" *intensa*, Butler, from the Aru Isles and New Guinea. Unfortunately the description is not comparative with *P. ilias*. It has a very quick flight, and sits in the hot sun on the tops of certain bushes with rounded leaves. Röber records it from Key as *Philiris* (n. g.) *ilias*, Felder. But "*Thecla*" *ilias* appears to be congeneric with *Pseudodipsas eone*, Felder (1860), the type of the genus *Pseudodipsas*, so *Philiris* would appear to fall to *Pseudodipsas*. The genus *Holochila*, Felder (1862), cannot stand, being preoccupied in Mammals, and *Erina* (1832-33), Swainson, cannot be used, as it is based on the typical species, "*Papilio*" *erinus*, Fabricius, from Australia. *Polycyama*, Scott (1890), appears on plate xii of Scott's "Australian Lepidoptera" for *Polycyama carythæ*, itself a synonym of *Papilio erinus*, and is a year older than Röber's name *Philiris*. All these names appear to be synonymous with *Pseudodipsas*. The genus *Candalides*, Hübner (1816), type *Rusticus Adolescens xanthospilos*, Hübner, is perhaps the oldest name for this group of butterflies.

### 54. THYSONITIS TRIOPUS, de Nicéville, n. sp.

HABITAT: Great and Little Ké Islands.

EXPANSE: ♂, 1·8 to 2·0; ♀, 2·0 inches.

DESCRIPTION: FEMALE. Nearest to *T. apollonius*, Felder, var. *supous*, H. H. Druce and Bethune-Baker, Proc. Zool. Soc. Lond., 1893, p. 542, pl. xlv, fig. 7, female, from Wammo Dobbo in the Aru Isles; differs in being ¼ of an inch greater in alar expanse; and the UPPERSIDE of

*both wings* having the white discal band of twice the width. **UNDERSIDE**, *both wings* have the white discal band of the same width as on the upperside, in var. *supous* the band is wider than on the upperside, though not as wide as in *T. triopus*. Differs from *T. hermes*, Grose Smith, Rhop. Ex., pl. Oriental *Lycænidæ* iv, figs. 7, 8, *female* (1895), from Korrido and Biak Islands, on the **UPPERSIDE** of *both wings* in having the discal band pure white instead of heavily irrorated with black scales. **UNDERSIDE**, *both wings* have all the metallic green or blue (according to the light) markings much more extensive. Differs from *T. apollonius* from several localities in New Guinea in my collection on the **UPPERSIDE** of *both wings* in having the discal white band much broader and pure white, instead of narrow, dusky and obscure. On the **UNDERSIDE** of *both wings* the discal band is wider, twice as wide on the *hindwing*. **MALE**, Indistinguishable from the same sex of *T. apollonius*. Both sexes tailless.

The description above shews that this species is based on the female sex only. It has been described from three males and one female. It occurs rarely on Great Ké, and flies about the trees along the banks of mountain streams; it is found also in high forest in Little Ké Isle.

#### 55. THYSONITIS KORION, H. H. Druce and Bethune-Baker.

*T. korion*, H. H. Druce and Bethune Baker, Proc. Zool. Soc. Lond., 1893, p. 547, pl. xlv, fig. 3, *male*.

Originally described from the Kei Islands, where it occurs on Little and Great Ké Isles, on the tops of bushes along the roads and paths. The **FEMALE** (hitherto undescribed) has on the **UPPERSIDE** of the *forewing* the costa widely black, extending into the middle of the discoidal cell, the outer margin broadly and increasingly black, the rest of the wing shining bluish-purple, with a white dash on the disc commencing on the disco-cellular nervules. *Hindwing* with the costa widely fuscous mixed with whitish, the outer margin more broadly black than on the forewing, the middle of the wing shining blue. **UNDERSIDE**, *both wings* exactly as in the male. This species has no tails.

#### 56. THYSONITIS ILLUSTRIS, Röber.

*Plebeius illustris*, Röber, Iris, vol. i, p. 53, pl. iv, fig. 6, *female* (1885).

We have this species from Great Ké only, where it is very rare. Messrs. H. H. Druce and G. T. Bethune-Baker in writing their monograph of the genus in Proc. Zool. Soc. Lond., 1893, p. 552, note that "The male only is described," but Herr Röber says his type specimen

was a female. We have both sexes. The hindwing bears a thin black tail tipped with white.

57. \**THYSONITIS CÆLIUS*, Felder.

Röber as *Plebeius cælius*, Felder, from Key. It is probable that Herr Röber so identified the species which has been described subsequent to his 1891 paper as *T. korion*, H. H. Druce and Bethune-Baker. The latter gentlemen spell the word *cælius*. As figured, this species has no tails.

58. *LYCÆNESTHES EMOLUS*, Godart.

Not rare on Little Ké Island. Caught on flowers and bushes in open places. It is highly probable we think that "*Plebeius*" *seltuttus*, Röber, Iris, vol. i, p. 67, pl. v, fig. 24, *male*; pl. iv, fig. 24, *female* (1886), from the Aru Isles, and East and North-West New Guinea, is the same species as *L. emolus*.

59. *LYCÆNESTHES TURNERI*, Miskin.

*L. turneri*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. xii, p. , n. 13, pl. Z, figs. 24, *male*; 25, *female* (1898).

Much rarer than the preceding species on Little Ké and found with it. It was originally described from Australia, and Australian specimens in de Nicéville's collection agree exactly with both sexes from the Ké Isles.

60. *EVERES ARGIADES*, Pallas.

Somewhat rare on Little and Great Ké, flies near the ground, amongst low plants.

61. *NACADUBA HERMUS*, Felder.

Röber and Ribbe as *Plebeius unicolor*, Röber, from Key, described from Ceram, Key and East Celebes. Herr Röber has sent a male to de Nicéville from Ceram, which proves that *P. unicolor* is a synonym of *N. hermus*. We have both sexes from the Ké Isles.

62. *NACADUBA MEIRANGANUS*, Röber.

Very rare on Little and Great Ké Islands. Originally described from the Aru Isles. Has a very quick flight, and settles on the leaves of bushes by the roadside. In coloration and markings the female of this species very closely resembles that sex of *Lycænesthes turneri*, Miskin.

## 63. NACADUBA ANCYRA, Felder.

Found not commonly on all the islands on the flowers of *Leguminosæ*.

## 64. NACADUBA PERUSIA, Felder.

Little Ké Isle, rare, mostly found sitting on the tops of dry bushes. *N. laura*, Doherty, is very close to *N. perusia*, if indeed actually separable, except perhaps in the female.

## 65. NACADUBA ATRATA, Horsfield.

Rather rare on Little Ké Isle.

## 66. NACADUBA NORA, Felder.

Little Ké Isle. The tailed form appears alone to occur, and is perhaps better known as *N. ardates*, Moore.

## 67. JAMIDES PURPURATA, Grose Smith.

*J. purpurata*, Grose Smith, Nov. Zool., vol. i, p. 574, n. 219 (1894).

Ribbe as *Plebejus astraptus*, Felder. *J. purpurata* was originally described from New Guinea. If we have correctly identified the Ké Island species the male is distinguished by its bluish-purple colour on the upper-side, which is not nearly as brilliantly metallic as it is in *J. bochus*, Cramer, and its allies, and the outer black border to both wings is about 1.5 mm. in width. It is near to *J. cephion*, H. H. Druce, Proc. Zool. Soc. Lond., 1891, p. 367, pl. xxxi, fig. 19, *male*, from the Solomon Isles, but has the black border to both wings on the upperside about twice as broad, and it is not "brilliant morpho blue." It differs from *J. astraptus*, Felder, as figured by Semper from the Philippines, in having the black border to the forewing on the upperside in the male less broad, and on the hindwing about twice as broad. In the Ké Isles it is rare, and is found on Little Ké Island only.

## 68. LAMPIDES ARATUS, Cramer.

Butler, Ribbe and Röber as *Lampides ætherialis*, Butler, from Ké Dulan (*Butler*), and Key (*Ribbe and Röber*). The commonest species of the genus on all the islands of the Ké Archipelago.

## 69. LAMPIDES CELENO, Cramer.

Butler as *L. xelianus*, Fabricius, from Ké Dulan, and Röber as *Plebeius xelianus*, from Key. Also very common on all the islands.



70. LAMPIDES AMPHISSA, Felder.

Rare on Little Ké Island. The *L. areas*, H. H. Druce, from the Solomon Isles, Proc. Zool. Soc. Lond., 1891, p. 368, pl. xxxii, figs. 7, male; 8, female, is very near to *L. amphissa*, which was originally described from Batjan.

71. LAMPIDES HYLAS, Cramer.

Röber as *Plebeius euehyllas*, Hübner. Not rare on damp spots on pathways in Little Ké, common on Great Ké.

72. CATOCHRYSOPS STRABO, Fabricius.

Ribbe as *Plebejus kandarpa*, Horsfield. Occurs commonly on leguminous plants on all the islands.

73. CATOCHRYSOPS LITHARGYRIA, Moore.

This species is found on Koer Island. The male is distinctly blue on the upperside, while *C. strabo*, Fabricius, is as distinctly purple.

74. CATOCHRYSOPS CNEJUS, Fabricius.

Extremely common on *Leguminosæ*. It occurs on Koer and the other islands of the Archipelago.

75. POLYOMMATUS BÆTICUS, Linnæus.

Ribbe as *Plebejus bæticus* from Key. Occurs rarely on Great Ké Island.

76. AMBLYPODIA sp.

Herr Kühn has sent to de Nicéville a somewhat rough coloured drawing of a species of *Amblypodia* which the latter is unable to identify. Herr Kühn caught a single specimen on Great Ké. The drawing appears to represent a female; the upperside is dark umber-brown, the forewing has a pale blue basal patch occupying about a third of the wing, and extending from the subcostal nervure to the inner margin. The hindwing has a similar basal patch, wedge-shaped, narrow at the base of the wing, wide outwardly, and occupying the whole of the discoidal cell. The underside of both wings is as usual in the genus of various shades of brown, more or less mottled with white. No species of true *Amblypodia* has, we believe, hitherto been recorded as far east as the Papuan region.

77. *ARRHOPALA HELIUS*, Cramer.

Rare on Little Ké, not seen at Great Ké. Found on young Djamboe trees (*Jambosa aquæa*, Rumph.).

78. *ARRHOPALA AMYTIS*, Hewitson.

Röber as *Amblypodia micale*, Blanchard, from Key. Common on Little Ké Island on Djamboe and other fruit trees. Mr. Bethune-Baker has kindly identified this species for us.

79. *CURETIS* sp.

Very rare, Kühn has only one male specimen from Little Ké Island in his collection, of which he has sent a coloured drawing to de Nicéville. Without knowing its female, it is difficult to identify the species. It agrees fairly well with *C. tagalica*, Felder, from the Philippines.

80. *HYPOLYCENA DANISOIDES*, de Nicéville.

*H. danisoides*, de Nicéville, Journ. A. S. B., vol. lxxvi, pt. 2, p. 558, n. 13, pl. iii, fig. 21, female (1897).

Very rare. Kühn has bred it, the larva feeding on orchids. The male differs only from the female in being smaller (1.1 inches in alar expanse), it has both wings narrower (less rounded), and the apex of the forewing more acute. The markings are precisely similar. It has no secondary sexual characters whatever.

81. *DEUDORIX EPIJARBAS*, Moore.

Found on Little Ké, and is very rare on flowering trees.

82. *RAPALA PHRANGA*, Hewitson.

Originally described from Batchian. According to the figure the Ké Isle form has rather more green-blue coloration on the upperside of the forewing in the male than the typical form. The FEMALE (hitherto undescribed) has the forewing on the UPPERSIDE wholly greenish-blue except the costa, apex and outer margin. Otherwise as in the male, save, of course, that the male secondary sexual characters are wanting. "*Deudorix*" *simsoni*, Miskin, from Northern Australia, differs but slightly from the Ké Isles form. It is found commonly on the leaves of trees and bushes along the roads, especially on Little Ké Island.

83. *BINDAHARA ISABELLA*, Felder.

Very rare, only a few specimens from Little Ké Island obtained.

## 84. LIPHYRA BRASSOLIS, Westwood.

A single male only obtained on Little Ké Island. Kühn caught it one evening at the lamp. The Hon. Walter Rothschild in Nov. Zool., vol. v, p. 97, n. 5 (1893), has described *Liphyra brassolis major* from females from Northern Australia. This may be the species named above.

## Family PAPILIONIDÆ.

## Subfamily PIERINÆ.

## 85. LEPTOSIA XIPHIA, Fabricius.

Common on all the islands, softly flying along close to the ground.

## 86. ELODINA EGNATIA, Godart.

The specimens from the Ké Isles agree with Hewitson's figure of "*Pieris*" *padusa* from Australia, except that the forewing is not nearly so produced at the apex, the costa consequently being shorter; the hindwing also is broader. Mr. W. H. Miskin in his Cat. Rhop. Aust., p. 8 (1891) gives *P. padusa* as a synonym of *E. egnatia*, but it is probably quite distinct. *E. egnatia* is not rare on Little Ké Island, but is a butterfly very difficult to catch. The two sexes are almost exactly alike. We have absolutely similar specimens from Wetter and Northern Australia.

## 87. CATOPSILIA CROCALE, Cramer. Plate I, Figs. 5, larva; 5a, 5b, pupa.

Wallace as *C. alcmeone*, Cramer. Röber as *C. pomona*, Fabricius, *C. crocale*, Cramer, and ab. *flava*, Butler. "*Papilio*" *crocale*, Cramer, and "*Papilio*" *pomona*, Fabricius, were described in the same year (1775). We prefer to use the former name as it was accompanied by a figure. There are several forms of this protean species occurring on all the islands of the Ké Archipelago. Taking those without ocelli on the underside, we have males with the yellow coloration evenly suffused over both wings on the upperside, with females to match them, the males agreeing with Butler's figure of "*Callidryas*" *flava*, from the Moluccas, &c., but the females are not nearly so heavily marked with black on the upperside as in Butler's figure of that sex of *C. flava*. Taking those with ocelli on the underside, we have males with the yellow coloration evenly suffused over both wings on the upperside like *C. flava*, and others with the yellow coloration confined to a well-marked basal area on both wings, beyond which the wing is white; the females are like the other form. It is very common, and Kühn has frequently bred it on "Djohur" trees, the larva being

shagreened, above grayish-green, with a shining steel-blue line above the spiracles, then a spiracular white stripe, which becomes yellow from the second to the fourth segments, the infra-spiracular region is light green, beneath it is bluish-green. Each segment bears six folds or creases, and all the segments are minutely dotted with black. The pupa is pale green, with the head produced into a long pointed process, the thorax humped in the dorsal line, there is a lateral yellow line running from the extreme apex to the posterior end of the pupa.

88. *TERIAS HECABE*, Linnæus.

Röber as *Eurema hecabe* from Key. Butler as *T. photophila*, Butler, from Ké Dulan. He describes the male only, and says it has no sub-apical brown patch on the underside of the forewing, this patch, however, is present in females from Ké. In his latest revision of the genus (*Ann. and Mag. of Nat. Hist.*, seventh series, vol. i, p. 75, n. 51 (1898), he places *T. photophila* as a synonym of *T. sulphurata*, Butler, which "Ranges from Northern Australia northwards to Timor Laut, Aru, and New Guinea, and thence eastwards to New Ireland, appearing just to touch the Solomons; more to the south it ranges eastwards to the Loyalty, New Hebrides, and Fiji Islands." Common on all the islands.

89. *TERIAS* sp.

Only one specimen from Little Ké. It is allied, from Kühn's description, to *T. læta*, Boisduval.

90. *TERIAS CANDIDA*, Cramer.

Not as common as *T. hecabe*, Linnæus, on Little and Great Ké Islands. Dr. Butler gives Amboyna and Ceram only for this species. Our male specimens agree with Cramer's figure, and have the abdominal margin of the hindwing on the upperside broadly black.

91. \**APPIAS LYNCIDA*, Cramer.

Röber as *Tachyris lyncida* from Key. We have seen this species only from Java, Bali and Lombok.

92. *APPIAS CELESTINA*, Boisduval.

Rare on Little Ké, somewhat more plentifully found on Great Ké Island. Our females are Form I, bluish-white, not rich yellow on the upperside.

## 93. APPIAS CLAVIS, Wallace.

Röber as *Tachyris ada*, Cramer, from Key. Originally described from Ké Island. It is rather rare on Little Ké, not so rare on Great Ké Island.

## 94. APPIAS ALBINA, Boisduval.

Decidedly rare on Little and Great Ké Isles. The Form I of the female, ground-colour white on both surfaces, appears to be the only one found.

## 95. HUPHINA RACHEL, Boisduval.

Röber as *Pieris pitys*, Godart, from Key. "*Pieris*" *rachel* was originally described from Java, but we have seen no specimens from thence. Our examples agree very well with the description, except that the small yellow spot at the external angle (apex) of the hindwing on the underside is often absent, and when present almost obsolete. "*Pieris*" *pitys*, Godart, is also a closely allied species, described from Java, also never seen by us, which is said to have four or five white spots arranged transversely in addition to the apical white spot on the upperside of the forewing, whilst our species has one or at most two subapical white spots only. *P. pitys* is figured by Lucas from Java, but he does not shew the four or five white spots mentioned above, and in other respects his figure does not agree with our specimens from the Ké Isles. Perhaps "*Pieris*" *perictione*, Felder, described from the Arru Islands, is nearest to our species, but it has never been figured, and a description alone is inadequate to enable one to discriminate between very closely allied species, though the description agrees very well with our specimens. *H. rachel* is very common throughout the year on all the islands.

## Subfamily PAPILIONINÆ.

## 96. TROIDES PRIAMUS POSEIDON, Doubleday.

Röber as *Ornithoptera priamus*, Linnæus. The Hon. Walter Rothschild in "A Revision of the *Papilios* of the Eastern Hemisphere, exclusive of Africa," Nov. Zool., vol. ii, p. 191 (1895) records this species as *T. priamus poseidon*, Doubleday, (*k*<sup>2</sup>): ♀—ab. *hecuba*, Röber (Tijd. voor Ent., vol. xxiv, p. 263 (♀, nec ♂) (1891), from the Key Islands. On Little Ké, Great Ké and Koer (Kühn got none from Tiandoe) this butterfly is always to be seen on the wing, but is never abundant. The larva feeds on a species of *Aristolochia*.

97. *PAPILIO POLYDORUS THESSALIA*, Swinhoe. Plate I, Figs. 6, larva; 6a, 6b, pupa.

Röber as *P. polydorus*, Linnæus. The local race *thessalia* was originally described from Ké Island (*Halliburton*). It is usually common on Little and Great Ké Isles, but is sometimes rare, flying in the open forest. The larva is very similar to that of *Troides priamus poseidon*, Doubleday, and feeds on the same plant, a species of *Aristolochia*: it is dark violet in colour, with tentacular fleshy pale red processes on the second, third, sixth, seventh, tenth and eleventh segments; those on the fourth, fifth, eighth and ninth are brownish-red; the process on the sixth segment is based on a pinkish-white spot; that on the seventh segment has a pale base; there is also a series of supra-spiracular processes. The pupa is pale brown, mottled with darker brown, with a pair of red spots on the middle of the back above; it is furnished with numerous foliaceous processes on the abdominal segments.

98. \**PAPILIO FUSCUS ROTALITA*, Swinhoe.

Röber as *P. beccarii*, Oberthür. This local race was described from Ké Island (*Halliburton*). We have not seen it. Mr. Kühn notes that he does not believe that this species ever came from the Ké Isles, as from 1889 to the present date no collector has been on the islands except himself; also that he (Kühn) up to 1896 has sent butterflies from the Ké Archipelago only to Dr. O. Staudinger, except one very small collection to Herr J. Röber, so from whom could Col. Swinhoe have obtained it? In the original description Col. Swinhoe gives *Halliburton* as the collector.

99. *PAPILIO ALBINUS THOMSONII*, Butler. Plate I, Fig. 7, larva.

Originally described from Ké Dulan. Mr. Rothschild in *Nov. Zool.*, vol. iii, p. 322, n. 3 (1896), has described an ab. *mordingtoni* from Little Kei Island, from one female, captured by the late Capt. H. Cayley Webster. Mr. Kühn writes to de Nicéville that had he gone on shore on New Guinea the day Capt. Webster was murdered by the natives, he (Kühn) would have shared the same fate. It was quite an accident that on that day he, for the first time during the expedition, remained on board their vessel. We have not seen this aberration. *P. thomsonii* is a very variable butterfly: in some specimens there is a well-defined oblique subapical white band on the upperside of the forewing which often dwindles away to nothing; the large discal white patch on the upperside of the hindwing varies greatly in size, in some specimens its outer edge is even, and in the other extreme it is highly irregular, being continued along the veins towards the margin; sometimes the

patch ends posteriorly on the first median nervule, sometimes it reaches the submedian nervure; on the underside of the forewing the subapical band is sometimes present, usually absent; on the hindwing there is sometimes a discal series of large irrorated white spots from the costa to the first median nervule, usually entirely absent; the blue and orange submarginal markings are also more or less developed, sometimes both series are absent. It is very common on both Little and Great Ké Isles. The larva is as variable as the butterfly, and feeds on various trees, especially those of the Natural Order *Aurantiaceæ*. The larva when young resembles a bird's dropping. When full-grown it is smooth with no processes; the head is pale green, the body is dark green, becoming yellowish-green laterally, the second, third and fourth segments beneath and the legs are brown, the fifth to thirteenth segments beneath and the prolegs milky-white; the fifth segment bears posteriorly a broad transverse black band, and the eighth segment bears an oblique short black band on each side just above the spiracles; on the fourth segment are two subdorsal milky-blue points on each side one above the other, with a black spot just anterior to the spiracle; on the ninth segment are two subdorsal obliquely-placed milky-blue points on each side one above the other; and on the eleventh segment there is one similar point on each side. Mr. Kühn notes that the spots are sometimes greenish-brown.

100. \* *PAPILIO ÆGEUS ORMENUS*, Guérin.

Röber as *P. ormenus*, Guérin. Mr. Rothschild gives (*b*<sup>2</sup>): ♂ — ab. *pandion*, Wallace, also (*f*<sup>2</sup>): ♀ — ab. *polydorinus*, Haase, also (*g*<sup>2</sup>): ♀ — ab. *amunga*, Boisduval, from the Key Isles, but they are unknown to us from the Ké Archipelago.

101. *PAPILIO ÆGEUS KEIANUS*, Rothschild. Plate I, Fig. 8, *larva*.

Mr. Rothschild has described this local race from the Little Kei Island (Kei Toeal); and also (*a*): ♀ — f. *amaranta*, and (*b*): ♀ — f. *blanca* from the same island (Nov. Zool., vol. iii, p. 422, n. 4 (1896)). All our specimens appear to belong to this local race (not to *P. ormenus*, Guérin), as in the males the discal white band ends on the first median nervule, and does not reach the submedian nervure as it does in *P. ormenus*. In one of our male specimens the orange-red anal spot on the hindwing on the upperside is absent, typically it is present, and Mr. Rothschild has seen no specimen in which it is absent. It is rather rare on Little and Great Ké, the female var. *blanca* especially so, and seen on the wing only at the end of the wet season. The larva feeds on orangeaceous trees. It is brownish-green, with lighter very fine lines

on each segment; the head and legs are black, with two short conical yellow processes on the anterior edge of the second segment, the third, fourth and fifth segments have each three pairs of similar processes, the sixth, seventh, eighth, eleventh and twelfth segments have each two pairs of similar processes; on the fifth segment is a broad black band ending on each side on the spiracular region; on the ninth segment arising from the spiracular region and extending backwards over the tenth segment is a broad oblique lateral band, which terminates in the subdorsal region in a black conical process; on the eleventh segment is a much shorter posteriorly oblique broad black band, not reaching the two black conical processes one on each side of the subdorsal region; the thirteenth segment is white marked with large black patches; posterior to the spiracles the body and the prolegs are white, more or less interrupted with black lines.

102. \*PAPILIO DEIPHOBUS, Linnæus.

Herr J. Röber in Tijd. voor Ent., vol. xxxiv, p. 275 (1891), described *P. deiphobus*, ab. *hypoxanthos* from the Key Islands. Neither Mr. Rothschild nor we have seen this species from thence. Mr. Rothschild spells the name "*hypoxanthus*."

103. PAPILIO EUCHENOR OBSOLESCENS, Rothschild.

Rare in Little Ké, not so rare in Great Ké Island. Mr. Rothschild suggests that *P. ambrax epirus*, Wallace, may occur in the Key islands, but we have not obtained it there. It is found on the Aru islands.

104. PAPILIO CODRUS TOEALENSIS, Rothschild. Plate I, Figs. 9, 9a, larva; 9b, 9c, pupa.

Described from Little Kei Island (Kei Toeal). It is not very rare on Little Ké, but is difficult to catch. Kühn has bred it, but does not know the name of its food-plant. The larva is smooth, rapidly increasing in width to the fourth segment, thence decreasing in width to the anal segment, the head, body and legs are yellowish-green; on the dorsal area of the fifth segment are eight short indigo-blue marks which form two diamond-shaped figures; on the twelfth and thirteenth segments are five similar marks, one in the middle with four around the central mark forming an oblong figure; the second, third and fourth segments each bears at the side a short, bluntly-conical, pale red, fleshy process; the thirteenth segment with a pair of diverging similar processes; the spiracles are indigo-blue. The pupa is violaceous light greenish-gray, sometimes yellowish-green; the anterior portion is broad, and produced into a rather high process dorsally; from the apex of this



process (which is dark brown at the tip) descends on each side to the spiracle at about the middle of the pupa a fine indigo-blue line, with a large round blue spot in its middle; the spiracles are dark brown; the pupa ends in a somewhat sharp point.

105. *PAPILIO EURYPYLUS MELAMPUS*, Rothschild.

Described from Little Kei Island (Kei Toal). Mr. Rothschild (Nov. Zool., vol. iii, p. 425 (1896), has also described an ab. *rufinus* from the same island. *P. melampus* is very rare, and is found on both Little and Great Ké Islands.

106. *PAPILIO SARPEDON CHOREDON*, Felder.

Rare on Little and Great Ké Isles. Very quick on the wing.

107. *PAPILIO AGAMEMNON ARGYNNUS*, Druce.

Recorded by Wallace from the Ké Island as *P. agamemnon*, local form *b*, and described from the Ké Island by Druce as *P. argynnus*. It is rather common on Little and Great Ké Islands. The larva feeds on *Anona muricata*, Linnæus, Malay name "Surakajah."

Family HESPERIIDÆ.

108. *TAGIADES JAPETUS*, Cramer. Plate I, Figs. 10, larva; 10a, 10b, pupa.

Röber, Ribbe and Butler. Very common on all the islands. The larva is greenish-white, the skin transparent, very finely striped with white, yellowish between the segmental folds; between the eighth and ninth segments are two yellowish coloured organs visible through the skin; the head is dark brown, heart-shaped, strongly indented above in the dorsal line. Pupa attached openly to a leaf by a few threads and by the cremastral hooks; pale yellowish, streaked throughout with reddish-brown; each wing-cover bears two large irregularly-quadrangular china-white spots, one at the base of the wing, which is the smaller, the other at the anal angle of the expanded wing, about twice as large; between the eyes in front are two white spots like a pair of spectacles; on the third, fourth and fifth abdominal segments is a triangular white spot on each side; the head is produced into a long thin pointed process. The larva lives on sweet potatoes.

109. \* *AMPITTIA MARO*, Fabricius.

Ribbe as *Pamphila maro*. This is probably a wrong identification.

## 110. \*NOTOCRYPTA WAIGENSIS, Plötz.

Röber as *Plesioneura waigensis*. We have been unable to recognise this species from the description only. It was originally described from Waigou.

## 111. NOTOCRYPTA FEISTHAMELII, Boisduval.

Not common on Great Ké, rare on Little Ké. Frequents wet places. Specimens from the Ké Isles and Northern Australia are peculiar in having the discal diaphanous band on the upperside of the forewing produced almost to the costa anterior to the costal nervure, instead of ending anteriorly on the subcostal nervure as usual.

## 112. \*TELICOTA AUGIAS, Linnæus.

Röber as *Pamphila augias*. We have not seen it from the Ké Archipelago, but its occurrence there is not improbable.

## 113. TELICOTA BAMBUSÆ, Moore.

Apparently not rare. Kühn has sent de Nicéville seven male specimens.

## 114. \*TELICOTA MOSELEYI, Butler.

*Pamphila moseleyi*, Butler, Ann. and Mag. of Nat. Hist., fifth series, vol. xiii, p. 198, n. 50 (1884).

Ké Dulan (*Butler*). Capt. E. Y. Watson in Proc. Zool. Soc. Lond., 1893, p. 103, places this species in the genus *Telicota*. It may be the same species as the next, with which it agrees in size. It was described from a male, while our *Padraona augiades*, Felder, is represented by a single female; the description of *P. moseleyi* does not agree with our specimen, but the differences may be due to sex.

## 115. PADRAONA AUGIADES, Felder.

This species was described from a male from Amboina, which was subsequently figured in the "Reise Novara." Of the six distinct orange and black Skippers we possess from the Ké Islands, this is by far the largest. It appears to be rare, we have a single female only, which is very similar to examples of the same sex of *P. palmarum*, Moore, from India, but is much larger, and is more tawny, less purple, coloured.

## 116. PADRAONA PROCLES, de Nicéville.

*P. procles*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. vii, p. 353, n. 21, pl. J, figs. 7, male; 8, female (1892).

Originally described from the Ké Isles, where it appears to be a common species on all the islands.

117. \*PADRAONA SUNIAS, Felder.

Dr. Butler records this species with a query from Ké Dulan. It was originally described from Amboina, but has not been figured. We have not been able to recognise it from the description only. Messrs. Elwes and Edwards place it as a synonym with a query of *Telicota* [*Padraona*] *dara*, Kollar (Trans. Zool. Soc. Lond., vol. xiv, p. 254 (1897)).

118. \*PADRAONA MÆSA, Moore.

Röber as *Pamphila mæsa*. We have no species of the genus from the Ké Archipelago which agrees with *P. mæsa*.

119. PADRAONA, sp. 1.

HABITAT: Little Ké Isle.

EXPANSE: ♂, 1·4; ♀, 1·5 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* black, with a slight purplish gloss; all the markings yellow; *cilia* yellow. *Forewing* with a short costal streak from the base of the wing; a similar streak in the discoidal cell; the space between these two streaks slightly irrorated with yellow scales; three conjoined subapical elongated dots, of equal length, the middle one placed slightly nearer the base of the wing than the others; four obliquely-placed discal spots, the anteriormost in the lower discoidal interspace small and quadrate, the second spot occupying the base of the second median interspace, its outer end excavated, the third spot larger than the second, occupying the middle of the first median interspace, its outer end excavated, the fourth spot crossing the middle of the submedian interspace, quadrate, its outer end excavated, its inner side not in a line with the spot anterior to it, being placed nearer the outer margin; from the posterior inner angle of this last-named spot runs a line of yellow scales along the submedian nervure to the base of the wing; a streak in the sutural area, its outer end in a line with the outer edge of the spot anterior to it. *Hindwing* with a rather small indistinct clump of setæ at the base; a discal transverse band, with even edges, and of equal breadth throughout, occupying the middle of the wing; some yellow setæ in the submedian interspace. UNDERSIDE, *both wings* with all the veins narrowly black; a narrow black anteciliary line, ending on the hindwing at the first median nervule. *Forewing* black, but the costa and apex to just posterior to the first

median nervule, where it fines away to nothing, dull brownish-yellow; the markings much as on the upperside, but those on the disc broader. *Hindwing* dull brownish-yellow; the discal band much narrower than on the upperside. ABDOMEN narrowly ringed with yellow. FEMALE. Differs from the male only in being a little larger.

This description has been drawn up by de Nicéville from three males and three females. It is a very distinct species, but he has not ventured to name it, as it has probably been already described from New Guinea or Australia, from whence he possesses but few species of the genus. It is very near to *P. autoleon*, Miskin, from Northern Australia.

120. PADRAONA, sp. 2.

HABITAT: Ké Isles.

EXPANSE: ♂, ♀, 1.0 inch.

DESCRIPTION: MALE. UPPERSIDE, *both wings* black, with golden-yellow markings; *cilia* yellow, marked with black at the ends of the veins, broadly on the forewing, narrowly on the hindwing. *Forewing* more yellow than black, there being a large basal triangular yellow patch from the costa to the submedian nervule and first median nervule, a short yellow streak in the submedian interspace, and a longer one in the sutural area; a discal yellow band extends nearly across the wing from close to the costa to the submedian nervule, its anterior portion shifted inwardly and out of line with the posterior portion, consisting of three conjoined increasing spots, the rest of the band consists of five spots, their inner edge straight, their outer edge toothed. *Hindwing* with a small yellow spot in the middle of the discoidal cell, with some yellow setæ anterior to it; a broad curved discal band, commencing just posterior to the costa by an oval spot, posterior to which is a small triangular spot placed nearer the margin than the spot anterior to it, and joined to the discal portion of the band, which latter crosses the middle of the wing, and is of equal width throughout, with slightly irregular edges. UNDERSIDE, *forewing* marked somewhat similarly to the upperside, but the base of the wing is black; there is a small patch of yellow scales posterior to the three anterior spots of the discal band; also a submarginal yellow band beyond the discal band from the costa to the first median nervule. *Hindwing* yellow; the discal band defined on both sides with a narrow black line; a prominent anteciliary black thread. ABDOMEN black, narrowly ringed with yellow. FEMALE, very similar to the male, but all the yellow markings on the upperside reduced in size, leaving more of the black ground-colour visible.

This description has been drawn up by de Nicéville from twelve

male and two female examples, which were received from Kühn as *Hesperia flavovittata*, Latreille, described from New Holland, with which description as far as it goes the specimens agree fairly well, but Mr. W. H. Miskin in his Syn. Cat. of the Lep. Rhop. of Australia places *H. flavovittata* in the genus *Taractrocera*, distinguished by its short round-clubbed antennæ, while the species described above has the longer pointed-clubbed antennæ of the genus *Padraona*. It appears to be quite a distinct species, but has probably already been named, indeed, in de Nicéville's collection from Mackay in North Australia are exactly similar specimens, which agree with Hewitson's description of "*Ancyloxipha*" *agraulia*, from the same region. The correct spelling of the genus is *Ancyloxypha*. Miskin places the latter species in the genus *Apaustus*, Hübner, and gives *Pamphila sunias*, Felder (see no. 117 above) as a synonym, though it has eight years' priority.

## 121. PADRAONA, sp. 3.

KABITAT: Ké Isles.

EXPANSE: ♂, .8; ♀, .9 of an inch.

DESCRIPTION: MALE. UPPERSIDE, *both wings* black, with yellow markings; *cilia* of the forewing black anteriorly, becoming yellow posteriorly, of the hindwing yellow, the terminations of the median nervules streaked with black. *Forewing* with a triangular yellow streak from the base of the wing to beyond the middle, not quite reaching the costa anteriorly, bounded by the submedian nervure and second median nervule posteriorly, its outer edge inwardly oblique; three conjoined subapical spots, the anteriormost a mere dot, the second twice as large as the one before it, the third twice as large as the second; a discal band consisting of five portions, separated from the subapical spots, the two anteriormost portions very small, the third elongated, occupying the base of the second median interspace, the fourth of the same length as the third, occupying the middle of the first median interspace, the fifth very narrow and linear, the outer edge of this band is nearly even, the inner edge very irregular, owing to the third and fourth spots being so much broader than the others; a yellow streak occupying the basal half of the sutural area. *Hindwing* with a small yellow spot in the middle of the discoidal cell; a broad discal band occupying the middle of the wing, both edges irregular. UNDERSIDE, *forewing* marked as above, but the apex is broadly yellow. *Hindwing* yellow throughout, except a broad black streak in the submedian interspace; the spot in the cell and the discal band defined outwardly by a narrow black line; an anteciliary black thread.

ABDOMEN yellow, narrowly banded with black. FEMALE differs from the male only in having the wings broader, and the apex of the *forewing* less produced.

Described by de Nicéville from six male and one female specimens. It is an easily recognised species, is the smallest of the yellow and black species occurring in the Ké Archipelago, and is not named here as it is probably known already from neighbouring islands. It is near to *P. mæsoïdes*, Butler, described from Malacca, and figured by Moore from Ceylon, but is much smaller, and differs a good deal in the details of the markings.

122. BAORIS (*Chapra*) MATHIAS, Fabricius.

The form of this species occurring in the Ké Isles has in the male only two most minute dots in the median interspaces in the forewing, on the underside of the hindwing the discal spots are also very small; the female is normal. *C. agna*, Moore, has the spots smaller than *C. mathias*, the present form has them smaller still. It is a common species on Little Ké Island.

123. BAORIS (*Parnara*) PHILIPPINA, Herrich-Schäffer.

This species has no spots in the discoidal cell of the forewing, there is a discal series normally of seven spots, but several of the anterior ones are often wanting, in an extreme form there are only two spots in all placed in the median interspaces. It is a common species on Little Ké Island.

124. \* BAORIS (*Parnara*) LARIKA, Pagenstecher.

Röber records this species from Key as *Pamphila larika*. It was described from Amboina (Jahr. des Nass. Ver. für Natur., vol. xxxvii, p. 207, pl. vii, fig. 1, *female* (1884). It is evidently closely allied to the preceding species, but has all the spots on the upperside of the forewing larger. Doubtless Herr Röber did not know *Parnara philippina*, Herrich-Schäffer, or he would have so named his specimens from Ké. It is very doubtful if two such closely allied species as *P. philippina* and *P. larika* are found in the Ké Archipelago, even if they be really distinct.

125. HASORA DOLESCHALLII, Felder.

Röber as *Ismene doleschalli* [sic!]. This beautiful species was originally described from the Moluccas. It is rather rare on Little and Great Ké Islands. The opposite sexes do not differ in markings and coloration. Kühn has bred it, but has not sent de Nicéville a description of its transformations.

## 126. HASORA DISCOLOR, Felder.

This species has been identified by de Nicéville from a coloured drawing of an unique specimen in Kühn's collection, taken on Little Ké Island, and which appears to be a female. The species was originally described doubtfully from Java. It is one of the handsomest "*Ismenes*" known. In de Nicéville's collection are both sexes from Northern Australia.

127. HASORA (*Parata*) MALAYANA, Felder.

Ribbe as *Ismene malayana*. Identified by de Nicéville from three females which agree exactly with Felder's figure of the species, and with some female specimens in de Nicéville's collection from the Andaman Isles. The Ké examples have no transparent spots whatever on the fore-wing. Messrs. Elwes and Edwards in their recent monograph, p. 301, place this species as a synonym of *H. chromus*, Cramer, which latter according to Dr. Aurivillius is a synonym of *H. alexis*, Fabricius (Ent. Tids., vol. xviii, p. 150, n. 68 (1897).

## 128. BADAMIA EXCLAMATIONIS, Fabricius.

Not uncommon on Little and Great Ké Islands. It is found from India to Australia.

## EXPLANATION OF PLATE I.

- Fig. 1, larva, *Euplœa (Hirdapa) assimilata*, Felder, p. 256.  
 ,, 2, larva; 2a, head of larva; 2b, 2c, pupa, *Cethosia cydalima*, Felder, p. 258.  
 ,, 3, young larva on food-plant; 3a, full-grown larva, *Neptis (Rahinda) consimilis*, Boisduval, p. 260.  
 ,, 4, 4a, 4b, pupa, *Charaxes keianus*, Rothschild, p. 262.  
 ,, 5, larva; 5a, 5b, pupa, *Catopsilia crocale*, Cramer, p. 271.  
 ,, 6, larva; 6a, 6b, pupa, *Papilio polydorus thessalia*, Swinhoe, p. 274.  
 ,, 7, larva, *Papilio albinus thomsonii*, Butler, p. 274.  
 ,, 8, larva, *Papilio aegus keianus*, Rothschild, p. 275.  
 ,, 9, 9a, larva; 9b, 9c, pupa, *Papilio codrus tocalensis*, Rothschild, p. 276.  
 ,, 10, larva; 10a, 10b, pupa, *Tagiades japetus*, Cramer, p. 277.

*Descriptions of some new plants from the North-Eastern Frontiers of India.*  
—By G. KING and D. PRAIN.

[ Received January 28th; Read March 2nd, 1898. ]

While dealing with various collections received from the North-Eastern Frontiers of the Empire in connection with the Botanical Survey of India, the writers have had to dispose of a number of species that appear to be new to science and that are unprovided with names in the Herbarium of the Royal Botanic Garden, Calcutta; the present paper contains descriptions of a few of the more notable of these. A considerable proportion of them it was necessary to have compared at Kew in order to make certain that they were unknown or unrepresented in the unrivalled collection there; our thanks are due to Mr. Thiselton-Dyer, the Director, and to Dr. Stapf, the Assistant for India in the Herbarium there, for kind assistance in connection the examination of these.

ANONACEÆ.

1. GONIOTHALAMUS PEDUNCULARIS *King & Prain*; frutex?, ramulis gracilibus glabris. *Folia* tenuiter coriacea, oblonga, plus minusve oblanceolata, breviter acuminata, basi cuneata; utrinque glabra, hebetia, subtus ex sicco pallide brunnea; nervis secundariis 10-12-jugis curvis intra marginem inosculantibus subtus plus minus prominentibus supra obsolete; petiolis brevibus 25-3 poll. longis, laminis 6.5-9 poll. longis, his 1.5-2.5 poll. latis. *Flores* solitarii erecti parum supra-axillares 1.5 poll. longi, pedicellis plus quam uncialibus adpresse puberulis, basin versus minute bracteolatis. *Sepala* carnosa, libera, ovata subacuta patentia utrinque puberula, .3 poll. longa. *Petala* carnosa, seriei exterioris oblique ovato-lanceolata, acuminata, basi angustata et incrassata ubi intus excavata, extus adpresse pubescentia intus basi puberula ceterum glabra 1.5 poll. long, .75 poll. lata; petala seriei interioris ovata, acuta basi angustata utrinque sed praesertim extus pubescentia, dimidio summo in calyptram basi 3-fenestratam cohaerentia. *Antherae* ∞, sessiles lineares apice capitatae. *Pistillia* circa 20, germina linearia, stylis linearibus pubescentibus duplo breviora. *Fructus* nondum communicatus.

In BURMA SUPERIORE: in montibus Kachin nuncupatis, *Kingii mercenar.*!

Of all the Indian species of this genus *G. peduncularis* most resembles the Ceylonese *G. Gardneri* H. f. & T. and *G. Thwaitesii* H. f. & T.



## STERCULIACEÆ.

2. *STERCULIA COGNATA* Prain; arbuscula ramulis gracilibus parce puberulis cortice brunneo obtectis. *Folia* glabra brevissime petiolata vel sessilia anguste lanceolata medio versus basin sensin attenuata apice anguste ovato-acuminata, margine integra, chartacea, subtus prominentius 25-30-nervia simulatque reticulato-venosa. *Flores* albi pedicellati pedicellis filiformibus glabris, in racemis quam folia dimidio brevioribus dispositi; *calyce* campanulato laevi intus glabro extus parcesissime puberulo, lobis linearibus erecto-patentibus tubo multo longioribus. *Follicula* oblonga acuta breviter pedicellata extus velutina intus glabra utrinque rubra; semina nigra nitida subsphaerica.

In montibus Kachin nuncupatis; *Kingii mercenar.*!

*Folia* 8-12 poll. longa, .75-2.5 poll. lata, petiolis nunquam .2 poll. saepius omnino absentibus; *racemis* 4 poll. longis, pedicellis capillaribus .3 poll. longis; *floribus* .6 poll. longis; *folliculis* 2.5 poll. longis, .75 poll. latis; *seminibus* .5 poll. diam.

Nearest *S. Roxburghii*, *S. parvifolia*, and *S. striatiflora* but easily distinguished by the sessile leaves and the other characters mentioned.

## CONNARACEÆ.

3. *TAENIOCHLAENA BIRMANICA* Prain; frutex ramulis puberulis teretibus cortice minute lenticellatis. *Folia* imparipinnata, foliolis 2-3-jugis, coriaceis, nervo mediano supra puberulo excepto glabris, oblongo-lanceolatis apice emarginato-caudatis basi inaequaliter cuneatis breviter petiolulatis, rachide puberulo. *Flores* in racemis brevibus vel paniculis congestis axillaribus dispositi, bracteis minutis, pedicellis longiusculis. *Calyx* basi hemisphaericus, laciniis valvatis oblongis acutis fructu revolutis. *Petala* ... *Stamina* 10, alterna paulo breviora, filamentis basi vix connatis. *Carpella* 5, sessilia, styli parum elongati, puberuli. *Capsulae* 1-3, sessiles, ovoideae, parum apiculatae, extus intusque glaberrimae. *Semen* oblongum basi arillo adnato dimidiato suffultum, testa nitida; cotyledones amygdalinae.

BURMA: in montibus Kachin nuncupatis, *Kingii mercenar.*!

*Folia* 6-8 poll. longa, rachide 3-4 poll., lamina terminali 3-5 poll. longa 1.5 poll. lata, lateralibus 1.5-3 poll. longis, petiolulis .15 poll. *Racemis* 1.5-2 poll. longis, pedicellis .3-4 poll. longis. *Capsulis* .6 poll. longis, .3 poll. latis.

Much resembles the only other known species, *T. Griffithii* Hook. fil., from Malacca, but with differently shaped leaflets and with fruits that are glabrous externally instead of pubescent.

## LEGUMINOSAE.

4. *INDIGOFERA NIGRESCENS* Kurz MSS. in *Herb. Calcutta*; fruticosa ramulis adpresse brunneo-setosis, foliolis minoribus 17-21, oppositis membranaceis, atro-viridibus, utrinque sparse adpresse puberulis. *Flores* in racemis angustis, elongatis, breve pedunculatis dispositi, bracteis linearibus alabastris longioribus, pedicellis brevissimis, calyce oblique campanulato, dentibus lanceolatis tubum excedentibus. *Corolla* rosea. *Legumen* lineare turgidum, adpresse puberulum, rectum, minute apiculatum, suturis parum incrassatis; semina 6-8.

In montibus KHASIA; apud Shillong, G. Mann! Clarke n. 5848! In montibus KACHIN, piope Myitkyina, *Kingii mercenar.*! In valle Taping, YUNNAN austro-occidentalis, apud Momien, J. Anderson! In montibus SHAN, ad Maymyo, *Kingii mercenar.*!

*Folia* 3-4 poll., foliola .5-.8 poll. longa, .3-.4 poll. lata. *Racemi* 4-8 poll. longi, pedunculis 1-pollicaribus, bracteis .2 poll., calyce .05 poll. longo, corollis .2 poll. longis tantum. *Legumen* .75-.85 poll. longum; .1 poll. crassum.

Very closely related to *Indigofera atropurpurea* with which it has been often identified and under which name it is usually met with in collections. The smaller flowers with longer calyx-teeth, shorter faintly apiculate and puberulous instead of glabrescent pods, as well as the very dark green leaves with more numerous and much smaller leaflets amply distinguish it.

5. *SPATHOLOBUS POTTINGERI* Prain; frutex scandens robusta, ramis cylindraceutis gracilioribus cortice brunneis, pilisque reflexo-adpressis sparse pubescentibus. *Folia* pinnatim 3-foliolata rachide pilis patentibus pallide fusco-hirsuta, foliolis subcoriaceis ambitu ovatis margine sinuatis supra uniforme subtus praesertim nervis pilis adpressis sparse hirsutis, nervo mediano subtus petiolulisque brevibus pilis patentibus strigoso, foliola terminali aequae basi late cuneata apice late truncata, nervis prominentibus lateralibus 9-jugis mediano in acumine subulato producto; foliolis lateralibus paullo minoribus basi parum inaequali intus cuneatis extus ovato-rotundatis nervis lateralibus 7-8-jugis, mediano ultra apicem abrupte acutam producto, stipulis deciduis lanceolatis stipellisque persistentibus subulatis adpresse hirsutis. *Flores* racemosi in paniculis terminalibus iterum terve ramosis ramis angulatis parcius pubescentibus dispositi, bracteis bracteolisque caducis minutis, pedicellis capillaribus calyce brevioribus. *Calyx* dense olivaceo-velutinus, dente summo apice emarginato ceteris anguste deltoideis omnibus tubo parum brevioribus. *Corolla* purpurea, vexillo ungue anguste cuneato apice emarginato, petalis ceteris unguibus gracilibus calycem subaequantibus, alarum laminis angulo inferiore utrinque barbellatis.

*Stamina* 2-adelphia filamentis vaginae carinalis alternis longioribus, filamento libero vexillari quam vaginam multo brevior. *Ovarium* puberulum breviter stipitatum, ovulis 2. *Legumen* ignotum.

In montibus KACHIN nuncupatis, apud Namli, 2000 p. s. m., *Pottinger!*

*Ramulis* floriferis .25 poll. diam.; *foliis* 8 poll. longis, rachide 2.5 poll. parte terminali partem petiolarem fere aequante, petiolulis .15 poll. stipellis .2 poll. brevioribus, stipulis .25-.3 poll. longis; lamina terminali 5.5 poll. longa 4 poll. lata, lateralibus 4.5 poll. longis his 3 poll. latis, acuminibus apicalibus .3 poll. longis. *Panicula* tota pyramidalis 1.5-2-pedalis, paniculis secundariis 8-10 poll. longis, iisque ordine tertio 4-6 poll. longis, racemis singulis 1.5-2-pollicaribus, 12-20-floris, pedicellis .12 poll., calyce .2 poll., corolla .3 poll. longis.

A very fine plant nearest to the Malayan species *S. gyrocarpus* and *S. ferrugineus* but abundantly distinct from these and from all the other Indian species by the sinuate finely apiculate leaflets.

#### CRUDDASIA PRAIN.

Calycis lobi acuti, 2 superiores in unum apice minute 2-dentatum connati, caetera aequilata triangulares infimo tamen lateralibus parum longiore. Vexillum suborbiculatum, basi nec inflexum; alae oblongo-ovatae basi carinae adhaerentes; carina cymbiformis erostris alis aequilonga. Stameu vexillare caeteris arcte connatum, antherae uniformes. Ovarium sessile  $\infty$ -ovulatum; stylus filiformis incurvus sub stigmatate terminali summo apice parce penicillatus ceterum glaber. Legumen elongatum, 2-valve, planum, coriaceum, compressum intus inter semina tenuiter faretum. Semina plano-compressa, suborbicularia, hilo ovato, estrophiolata. Caulis alte volubilis, foliis pinnatim 5-foliolatis, foliolis anguste ovatis, stipellatis. Stipulae spinuloso-setaceae caducae, basi fixae. Flores purpurascens, in pedunculis elongatis fasciculato-racemosi, fasciculorum rachide nodiformi. Bractee bracteolisque caducae. Calyx vexilloque extus sericeus.

Species singula, montium Kachin incola. Genus subtribubus *Galactiearum*, praesertim sectioni *Collæae* generis *Galactiae* cui etiam stamen vexillare cum ceteris medio connatum, vel *Diocliearum* praesertim generi *Puerariae* fere aequae recte attribuendum; statim tamen ab ambabus stylo more *Euphaseolarum* nonnullarum circa stigma barbato differt, ideoque potius pro genere distincto *Dioclieis* uti *Citoria Glycineis* relato habenda.

#### 6. CRUDDASIA INSIGNIS Prain.

In montibus KACHIN nuncupatis, 5000 p. s. m., *Kingii mercenar.!*

Petioles 2.4 poll. rachides communi 1.5 poll. supra canaliculati,

retro-setosi, laminae ovato-lanceolatae 3-6 poll. longae, 1·5-2·5 poll. latae, supra glabrae, subtus adpresse pubescentes, inter nervis 12-15-jugis subtus prominentibus reticulato-venosae; stipellae filiformes ·1 poll. longae, petiolulae 1·5 poll. longae; stipulae rigidae ·2 poll. longae. *Racemi* 8-12 poll. longi pedunculis 3 poll. longis, nodis vix ·2 poll. remotis, pedicellis ·12 poll. longis. *Calyx* ·2 poll. tubo campanulato dentibus aequilongo. *Corolla* ·4 poll. longa, vexillo orbiculato ·35 poll. lato, extus dense sericeo. *Legumen* 3 poll. longum, ·3 poll. latum, seminibus 10-12, ·25 poll. longis, ·2 poll. latis.

7. *PUERARIA BELLA* Prain; volubilis ramis gracilibus glabris, foliis 3-foliolatis stipulis caducis stipellis capillaribus, foliolis chartaceis ovatis longe acuminatis basi cuneatis utrinque petioloque glabris, petiolulis parce puberulis. *Flores* in racemis elongatis simplicibus vel parce ramosis dispositi, rachide parce puberulo, pedicellis brevissimis, bracteis deciduis bracteolis 2 sub calycem persistentibus cordato-ovatis parce puberulis. *Calyx* campanulatus glabrescens, segmentis 2 summis in labium apice emarginato truncatum connatis, caeteris ovatis obtusis subaequilongis omnibus tubo parum brevioribus. *Corolla* purpurea calyce plus duplo longiore, vexillo basi auriculis inflexis appendiculato, carina rectiuscula alas subaequante. *Stamen* vexillare omnino solutum, antherae uniformes. *Ovarium* sessile  $\infty$ -ovulatum stylus filiformis superne inflexus, imberbis; stigma capitatum. *Legumen* ignotum.

In montibus KACHIN nuncupatis, prope Myitkyina, *Kingii mercenar.*!

Foliola 6 poll. longa, 3 poll. lata, stipellis filiformibus ·25 poll. longis, petiolulos aequantibus. Bracteolae ·1 poll. longae. *Calyx* ·25 poll. longus. *Corolla* ·7 poll. longa.

This very distinct species belongs to the subgenus *Neustanthus*, which is marked by having entire leaves that are contemporaneous with the flowers. The general appearance of the plant most readily recalls that of *Pueraria Thunbergiana* but its stipules are not persistent as in that species and the calyx is widely different. The fact that the vexillary stamen is quite free marks it as an aberrant *Pueraria* to be placed near *P. peduncularis* which exhibits the same character. The flowers—though not the bracts—recall those of *Mastersia assamica* and till ripe fruits are reported it can not be quite certain that it should not be referred to that genus. Meanwhile it is most satisfactorily located in *Pueraria* of which it has all the facies.

8. *DERRIS LATIFOLIA* Prain; arbor alta, foliis magnis, foliolis 5-7 chartaceis ovato-lanceolatis apice acuminatis basi cuneatis vel subrotundatis. *Flores* in paniculis amplis thyrsoideis axillaribus dispositi

rachide ramisque glabris angulatis nodis nec tumidis nec productis, pedicellis distinctis approximatis; calyce glabrescente campanulato margine truncato; corollae vexillo erecto orbiculari, basi ecallosa rotundato; filamenta 2-adelphia glabra; ovario puberulo, ovulis 3. Legumen ligulatum tenue glabrum suturis utrinque alatis nec sinuatis.

In montibus KACHIN, apud Namli, 4000 p. s. m., *Kingii mercenar.*!

Folia 18-24 poll. longa, foliolis 8-10 poll. longis 3:5-4 poll. latis utrinque glabris petiolulis .25 poll. longis. Paniculae 20-25 poll. longae, ramulis 2-4 poll. longis; pedicellis .1 poll. longis; calyce .12 poll. longo .15 poll. lato; corolla .3 poll. longa, vexillo .35 poll. lato; legumine 3.5 poll. longo, 1 poll. lato; alis .15-.2 poll. latis subaequilatis.

This species is very nearly related to *D. thyrsiflora* which it much resembles in flowers and pods except in having them distinctly pedicelled; in this latter respect it more nearly approaches *D. Wallichii* of which we were at first inclined to treat it as a large flowered variety. The much larger leaflets however and the fact that this is a tall tree makes it preferable to treat it as a distinct species.

9. DALBERGIA KINGIANA Prain; frutex scandens lignosa, cortice lenticellato, foliolis 5-7 anguste ovatis apice breviter acuminatis, basi cuneatis supra glabris subtus sparse puberulis, coriaceis. Flores paniculati, paniculis axillaribus, foliis brevioribus, ramulis subcorymbosim dispositis, pedicellis brevissimis; calyce dense ferrugineo, dentibus 3 inferioribus anguste triangulis, summos breviores latioresque excedentibus; petalorum unguibus calyce aequilongis; staminibus 9 monadelphis; ovario glabro 2-ovulato; stylo subulato. Legumen ignotum.

In montibus KACHIN nuncupatis, *Kingii mercenar.*!

Foliola 2.5-3 poll. longa, 1-1.25 poll. lata; rachide 3 poll. longo petiolulis .2 poll. longis; paniculae 3.5 poll. longae, ramulis 1-1.5 poll. longis, floribus .25 poll. longis.

Very near to *Dalbergia Benthami* Prain, (*D. rubiginosa* Benth. Flor. Hong-Kong 93, not of Roxb.) from Hong-Kong, but with quite different leaflets and with rather longer panicles of similar flowers. Also near *D. rubiginosa* Roxb., from Western India, but again with different leaflets and rather larger flowers. In general appearance *D. Benthami* resembles *D. rubiginosa*, to which Mr. Bentham has referred it, but the leaflets of the Chinese plant are thicker, narrower towards the tips, and have a different pubescence beneath; the flowers too of the Chinese plant are very like those of the present Kachin species and are considerably larger than there of *D. rubiginosa*.

10. BAUHINIA POTTINGERI Prain; robusta scandens, ramulis lenticellatis, glabris, cortice brunneis; forsan cirrhifera. Folia quam lata parum longiora, basi cordata, quadrante antico sinu angusto apiculato

2-loba; crasse coriacea, supra nervis parce hirsutis exceptis glabra subtus paucissime ferruginea, nervis 9-11, petiolo glabro, stipulis caducis. *Flores* racemosi, racemis terminalibus ferrugineo-velutinis bracteis lanceolatis pedicellis erecto-patentes fere aequantibus, bracteolis bracteis similibus, alabastris clavatis parte superiore oblonga basin ampullaeformem excedente. *Calyx* ferrugineo-pubescentis, limbo 5-partito segmentis oblongo-lanceolatis tubo basin versus parum dilatato. *Petala* 5, subaequalia, oblanceolata obtusa, longe unguiculata magnopere exserta, utrinque dense sericea. *Stamina* 3 fertilia, antheris lineari-oblongis, filamentis medio parum incrassatis. *Ovarium* distincte stipitatum, dense ferrugineum, stylo crasso ferrugineo, stigmatibus obliquo peltato. *Legumen* ignotum.

In montibus KACHIN nuncupatis, inter Namlao et Bansparao, *Pottinger!*

*Folia* 2·5-4 poll. longis, his 2·25-3 poll. latis, petiolo 1-1·3 poll. longo. *Racemis* 6 poll. longis, 4·5 poll. latis, pedicellis ·75 poll. longis; alabastris 1·75 poll. longis. *Calycis* tubo ·75 poll., limbo 1 poll. longo. *Petalis* 2 poll. longis. *Filamentis* 2·5 poll. longis.

A very fine species, nearest to *B. nervosa*, a Khasia plant, from which it differs in its leaves with fewer nerves, its shorter pedicels, and its rather larger petals silky instead of rusty externally. In the size of its flowers its only rival in the group to which it belongs is *B. excelsa* Bl., from Borneo; the shape however of the petals is different, those of *B. excelsa* being narrower and more acute at the apex.

#### SAXIFRAGACEÆ.

11. *HYDRANGEA POTTINGERI* Prain; fruticosa, ramis novellis pubescentibus; *foliis* oblongo-lanceolatis acuminatis margine basi cuneato excepto serratis, utrinque nervis adpresse puberulis ceterum glabris, nervis 9-10-paribus ascendentibus; cyma ampla dichotoma ramis pedicellisque pubescentibus ebracteata, florum radiantium sepalis 3 breviter unguiculatis late ovatis subacutis versus apicem grosse serratis ceterum integris venis prominulis utrinque reticulatis glabris, fertiliis dentibus calycinis triangulis tubo brevioribus; *petalis* . . . ; *staminibus* . . . . .; *stylis* 3 erecto-patulis ovario globoso parum brevioribus.

In montibus KACHIN nuncupatis, 4100 p. s. m., *Pottinger!*

*Folia* 3-4 pollicaria, 1·25 poll. lata, petiolis ·5-·6 poll. *Cyma* pedunculo 1·25 poll. longo, pedunculis secundariis 1-pollicaribus, pedicellis florum radiantium gracillimis 1·5 poll., pedicellis fertilibus ·2-·25 poll. *Capsula* ·08 poll. diam.

## POTTINGERIA PRAIN.

*Calycis* tubus brevis late campanulatus basi ovarii adnatus, lobis 5 ovatis acutis persistentibus sinubus latis. *Petala* . . . *Stamina* 5 erecta ad marginem disci perigygni affixa, filamentis sursum subulatis, basi parum explanatis ibique extus glandula mediana ornatis; <sup>2</sup> antherae . . . . .; ovarium semisuperum. *Capsula* supera oblonga, longitudinaliter parum 3-sulcata per stylos 3-partibilis stigmatibus cohaerentibus septicide 3-valvis, placentis a marginibus introflexis carpellorum simulac secedentibus persistentibusque, singulis utroque margine semina circa 10 triente summo tantum fertili gerentibus. *Semina* anguste fusiformia testa crustacea parum reticulata utrinque parum producta; embryo cylindrica majuscula in axe albuminis carnosae.—*Folia* alterna brevipetiolata, 5-nervia. *Cymae* multiflorae axillares. Species singula montium Kachin incola.

12. POTTINGERIA ACUMINATA *Prain*; *folia* ovato-acuminata crasse coriacea utrinque glabra subtus punctata, breve petiolata, margine integra nervis 5 mediano proximisque subaequalibus marginalibus tenuioribus omnibus plus minus subtus prominentibus; *cymae* axillares pedicellis gracilibus calyce paullo longioribus, bracteis parvulis.

In montibus Kachin, 3,000 p. s. m.; *Pottinger*!

*Folia* 2-3·5 poll. longa ·75-1·5 poll. lata, petiolis ·2 poll. longis. *Cymae* 1·5-2 poll. longae 1 poll. latae, pedicellis ·15 poll. longis; *capsulis* ·2 poll. longis ·15 poll. latis.

A very distinct genus of the Tribe *Escalloniae*, apparently best located near *Itea* which it resembles in having a similarly partible style with a similarly half-superior ovary but from which it differs markedly in having 3 instead of 2 carpels and in the capsule so dehiscent that when the valves fall away the three filiform placentas persist. The cinnamon-looking or Melastomaceous-like leaves and the very different inflorescence also help to give it a quite distinct facies.

Unfortunately our solitary specimen has been collected just as the plant was passing out of flower so that the petals and anthers have all dropped, and it is not therefore possible to state whether the former are valvate or imbricate.

## COMBRETACEÆ.

13. TERMINALIA ARGYROPHYLLA *King & Prain*; arbor magna, ramulis gracilibus foliisque utrinque dense tomento adpresso persistente argyreis; *foliis* suboppositis petiolatis ovatis basi rotundatis apice acutis, nervis 8-9-jugis ascenduntibus subtus prominulis, petiolis apice 2-glandulosis; *floribus* parvis, lutescentibus, spicatis, spicis in paniculis terminalibus dipositis, bracteolis lanceolatis deciduis quam flores duplo

brévioribus; *calyce* extus glabro limbo late campanulato lobis 5 parvis acutis, intus dense argyreo-villoso, tubo ovato tereti; *fructus*. . . .

In montibus KACHIN nuncupatis; *Kingii mercenar.*!

*Folia* petiolis .75 poll., laminiis 4 poll. longis 1.75 poll. latis. *Spicae* singulae 3.5–4 poll. longae, paniculis 8 poll. longis, 6 poll. latis.

This is very different in foliage from any species of *Terminalia* in Herb. Calcutta or in Herb. Kew; it is reported by the native collector (Shaik Mokim) to be a “timber tree.” The fruits sent as belonging to it are drupes shaped like those of *T. Chebula* but much smaller, being only .5 in. long; as however there are none of them attached to leaf-specimens it must remain for the moment doubtful if they really belong and if therefore the species is really referable to § *Catappa*, which must be the case if the fruits in question be those of this tree.

#### CUCURBITACEÆ.

14. ALSOMITRA PUBIGERA *Prain*; *foliis* breve petiolatis, pedato-5-foliolatis, foliolis petiolulatis, membranceis ovatis, acutis subobtusis vel retusis, margine integris puberulis; basi, terminali excepto, parum obliquis, membranaceis, supra nervis densius ceterum parcissime puberulis; subtus, nervis exceptis, glabris, penninerviis, petiolulisque dense puberulis; cirrhis apice bifidis; *fructu* puberulo; *seminibus* stramineis utrinque spinuloso-rugosis.

In montibus KACHIN nuncupatis, *Kingii mercenar.*!

Alte scandens; rami graciles elongati, ramosi, puberuli sulcati. *Petiolus* vix striatus .4–.5 poll. longus; petioluli, terminalis .3 poll., laterales .15 poll. longi; foliola utrinque intense viridia, 1.5–4 poll. longa, .75–2.5 poll. lata. *Cirrhi* graciles sulcati puberuli. *Paniculae* majusculae valde pluriflorae. *Pedunculus* communis lateralis terminalisve, gracilis parum sulcatus dense puberulus 2–4 poll. longus, pedicelli capillares puberuli .4 poll. longi, bracteolae subulatæ. *Calyx* puberulus segmentis lanceolatis, linearibus, acutis, corolla glabriuscula, segmentis ovatis acutis .1 poll. longis. *Fructus* subcylindricus densius velutino-puberulus, ab apice ad basin leviter attenuatus, apice truncatus, basi subacutus 2.25 poll. longus, .5 poll. crassus. *Semina* ambitu subtriangularia, margine profunde lobata basi oblique attenuata, .3 poll. longa, .25 poll. lata, .15 poll. crassa; ala obliqua alba translucens anguste oblonga, apice rotundata .75 poll. longa, .25 poll. crassa, utrinque areola clypeata spinuloso-rugosa exsculpta.

This very distinct species is most nearly related to *A. clavigera*, the fruits, except for being densely puberulous, being very like those of that species. But it differs very markedly in its pedate leaves and in its spinulose-rugose seeds. By an oversight a number of flowering speci-



mens of this species have been distributed to various European Herbaria under the name *Gynostemma pedatum*; recipients of these specimens are hereby requested to correct the name. These flowering examples were received in November, 1897, the fruiting ones in January, 1898.

### ARALIACEÆ.

15. *PENTAPANAX STELLATUM* King; scandens, novellis digito minimo fere crassis, cortice pallido glabro lenticellis ornato. *Folia* pinnata, rachide gracile glabra basi parum dilatata; foliolis 5, jugis 2 cum terminali, late ovatis vel ellipticis, apice abrupte acutis, basi rotundatis margine integris parum recurvis; supra glaberrimis, subtus pilis longioribus stellatis dense obtectis; nervis 4-5-jugis parum incurvis subtus prominulis supra distincte impressis; petiolulis inaequilongis iisque jugi summi fere 0. *Panicula* terminalis basi bracteis lanceolatis pluribus obsita, sparse ferrugineo-puberula, ramis inferioribus patentibus remotis, singulis umbellas plures 15-25-florales pedunculatas ferentibus, parte summa umbellas simplices ferente. *Flores* late oblongi; *calycis* tubo late campanulato, limbo 5-dentato, dentibus latis obtusis; *petalis* late ellipticis. *Fructus* ovoideo-globosus prominenter 5-costatus, glaber.

BURMA: in montibus Shan nuncupatis, apud Fort Stedman; *Kingii mercenar.*!

*Folia* 9-15 poll. longa, foliolis 3-5 poll. longis, 2.5-3.25 poll. latis petiolulis folioli terminalis 1-1.5 poll., lateralium inferiorum .1-1.5 poll. longis, lateralium summorum fere obsoletis. *Panicula* 12-18 poll. longa, ramis inferioribus 3-4 poll. *Flores* .1 poll. lati. *Fructus* .15 poll. longus.

*Pentapanax* is a small genus of which hitherto only six species have been described; and of these only one has hitherto been recorded from Burma. The species now for the first time described differs from all the others in the dense and very peculiar pubescence by which the under surfaces of the leaves are clothed. The hairs are long, flexuose, and united to form large stars of a pale yellowish-brown colour.

16. *HEPTAPLEURUM* (§*Agalma*) LAWANCEANUM Prain; arbor?, novellis parce puberulis. *Folia* digitata foliolis 7-9, late ellipticis apice mucronulatis, margine integris utrinque glaberrimis, crasse coriaceis; nervis 20-30-jugis obscuris petiolulis glabris. *Panicula* ramosa, ramis puberulis ramulos fere farinoso-puberulos umbelliferos distinctes emitentibus, umbellis 12-20-floris, pedicellis aequilongis floribus parum brevioribus. *Calyx* margine truncatus. *Petala* valvata, circa 7, triangulara, intus glabra extus pilis coactis dense obtecta. *Stamina* petalis isomera antheris oblongo-ovatis sursum parum angustatis. *Fructus*

turbinatus apice truncatus, medio columna cylindrica (stylis connatis) coronatus, 7-angulatus.

BURMA SUPERIOR: in montibus Kachin; *Pottinger!*

*Foliola* 10 poll. longa, 6 poll. lata. *Paniculae* rami pedales, ramulis 1·25 poll. longis, pedicellis ·2 poll. longis. *Flores* ·25 poll. longis, ·2 poll. latis.

17. *DENDROPANAX LISTERI* *King*; arbuscula glabra parva, novellis cortice grosse lenticellatis ex sicco pallide brunneis. *Folia* simplicia, tenuiter coriacea, late elliptica breviter acuminata, basi cuneata, margine integra vel dentibus paucis remotis minutis irregulariter serrata; utrinque glaberrima supra hebetia; subtus reticulato-venosa, nervis secundariis distinctis; costa mediana subtus prominente a basi venas 2 ceteris crassiores fere ad apicem ascendentes saepius etiam 2 tenuiores marginales emittente, lateralibus supra laminam mediam 3-4-jugis curvatis; petiolis gracillimis inaequilongis. *Panicula* axillaris, ramis paucis umbellatis, umbellis 4-5-floris, floribus subglobosis pedicellis gracillimis. *Calycis* tubus subglobosus limbus angustatus margine minute 5-dentatus. *Fructus* sphaericus stylis brevibus basi connatis apice recurvis coronatus.

In montibus DAPHLA nuncupatis, apud Torupati, 5,500 p. s. m., *J. L. Lister!*

Arbuscula 20-pedalis. *Foliorum* laminis 3·5-8 poll. longis, his 1·65-4 poll. latis; petiolis 1·5-7 poll. longis. *Flores* ·15 poll. diam., pedicellis ·3 poll. longis. *Fructus* ·2 poll. diam.

This very distinct *Dendropanax* was collected by Mr. J. L. Lister, in whose honour it is named, when accompanying the Daphla Hill expedition of 1874.

#### CORNACEAE.

18. *ALANGIUM KINGIANUM* *Prain*; frutex scandens, inermis, novellis puberulis; *folia* membranacea, oblongo-ovata, basi truncato-cuneata, apice rotundato demum breviter acuminata utrinque nervis puberulis ceterum punctulata, basi sub-trinervia nervo mediano robustiore nervos ascendentes 5-6-jugos emittente; *flores* in cymis laxis axillaribus foliis multo brevioribus dispositi, pedunculis pedicellisque puberulis; *calyce* dense puberulo breviter 7-dentato, *petalis* lutescentibus extus puberulis saepissime 7, anguste linearibus apice subacutis; *staminibus* 14, filamentis brevissimis pubescentibus, antheris linearibus; *drupis* parcissime adpresse puberulis, parum compressis, longitudinaliter 14-decim lineatis basi roundatis apice subacutis.

In montibus KACHIN nuncupatis, apud Agata Kedan, etc., *Kingii mercenar.!*

*Folia* 4-6 poll. longa, 1·5-2·5 poll. lata, petiolis ·25 poll. longis.

*Cymarum* pedunculis ·5-·75 poll., cymis 1 poll. latis 8-12-floris, pedicellis ·25 poll. longis. Flores ·3 poll. tantum longis. *Drupae* ·4 poll. longae, ·25 poll. latae.

A very distinct species not before represented in Herb. Calcutta or in Herb. Kew; the affinity, Dr. Stapf has been kind enough to note at Kew, is with *Alangium Faberi* Oliv., a species not present at Calcutta.

19. *MASTIXIA EUONYMOIDES* Prain; arbor, foliis oppositis longiuscule petiolatis, laminis ovatis apice acuminatis basi cuneatis, margine integris, crasse coriaceis, supra intense viridibus subtus prasinis, utrinque glaberrimis, nervis 6-8-jugis subtus distinctioribus parum ascendentibus; *thyrsus* laxus dichotomus, pedunculo ramisque glabris; *flores* ignoti; *fructus* anguste ellipsoideus.

In montibus KACHIN; *Kingii mercenar.*!

*Folia* petiolis ·75 poll. longis, laminis 4 poll. longis, 1·75-2 poll. latis; pedunculis 2·5 poll. longis, *thyrsis* 2-2·5 poll. latis; *fructus* calycis limbo 4-dentato coronatus, ·6 poll. longus, ·3 poll. crassus.

A very distinct species.

#### RUBIACEÆ.

20. *OPHIORRHIZA LAWRANCEANA* King & Prain; caulis brevis basi radicans adscendens vel 0; *folia* elliptico-oblonga, apice acuta basi cuneata, petiolis brevibus parce puberulis, laminis nervis subtus parce puberulis, ceterum utrinque glaberrimis, stipulis e basi trianguli filiformibus, *cymae* longe pedunculatae congestae glabrae, bracteolis spatulatis obtasis glabris persistentibus, *calycis* dentibus brevibus triangulis, *corolla* brevis tubo cylindrico, limbo angustato; *capsula* glabra.

In montibus Kachin nuncupatis, *Kingii mercenar.*!

*Folia* 1·25-3·5 poll. longa, ·75-1·5 poll. lata, lurida. *Cymae* ·3-·5 poll. latae, pedunculis gracilibus 3 poll. longis. *Corolla* ·2 poll. longa, tubo angustato.

Very similar to *O. lurida* Hook. fil. from the Eastern Himalaya in size and habit, and no doubt related to that species. The bracts are however different and the corollas are smaller and much narrower.

21. *PAEDERIA CRUDDASIANA* Prain; volubilis corolla excepta omnino glaberrima; *folia* opposita petiolata ovata basi truncata apice acuta; *flores* congeste cymosi in paniculis axillaribus terminalibusque laxis per paribus distantibus dispositi; *calycis* dentibus 5 brevibus triangulis, tubo campanulato, bracteolis subulatis; *corolla* extus puberula tubularis, intus dense tomentosa; *fructus* oviformis calycis dentibus coronata.

In montibus KACHIN nuncupatis, *Kingii mercenar.*!

*Folia* 2-5 poll. longa, 1-2·5 poll. lata, petiolis 1-1·25 poll. longis; *paniculae* 4-8 poll. longae, ramis ·5-1·5 poll. longis, cymis

singulis terminalibus  $\cdot 5$ – $\cdot 75$  poll. latis. *Corolla*  $\cdot 5$  poll. longa. *Fructus*  $\cdot 25$  poll. longus,  $\cdot 3$  poll. latus.

This very distinct species belongs to the group characterised by having the fruits uncompressed and differs very markedly from the other species of that group in having the fruits egg-shaped, narrowed upwards from the middle, and not subglobose rounded at the top as in *P. tomentosa*. From *P. linearis*, the other Indian species referred to the group, it differs much in foliage—its general facies, except for the fruit, being very much that of the common *P. foetida*.

#### VACCINIACEÆ.

22. *AGAPETES POTTINGERI* Prain; frutex epiphytica, ramis adpresse puberulis et pilis rigide setaceis patentibus ferrugineis simulac obsitis. *Folia* sessilia ovato-lanceolata a basi fere rotundata sensim ad apicem longius acuminatam attenuata, margine integra, coriacea, utrinque glabra, nervis 8–10-jugis supra distinctioribus. *Inflorescentia* corymbosa ramiflora pedunculo pubescenti bracteis rigidis cincto, pedicellis gracilibus pubescentibus basi bracteatis, bracteis majusculis ovato-lanceolatis rigidis striato-reticulatis margine puberulo excepto glabris. *Calycis* tubo globoso cum apice pedicelli parum ampliati articulado extus pilis longis fulvis setaceis apice glandulosis patentibus obsito, limbo campanulato margine 5-dentato prorsus reticulato, dentibus triangulis quam partem limbi connatam brevioribus, intus glabro extus pilis flaccidis longis sparse pubescente. *Corolla* tubulosa recta medio parum ampliata sub limbo breviter 5-lobo lobis late triangulis subobtusis parum contracta, extus parce pilis flaccidis pubescente, lobis viridibus ceterum rubris nec lineis notatis. *Stamina* 10, epigyna, libera, filamentis antheras fere aequantibus, antherisque glabris; antherarum tubulis corallae limbum vix attingentibus, dorso 2—calcaratis. *Ovarium* 5-loculare stylo filiformi apice brevissime 5-lobulato ovulis numerosis.

In montibus KACHIN nuncupatis, 4100 p. s. m., *Pottinger*!

*Folia* 5–7 poll. longa, 1·5–2·25 poll. lata. *Corymbis* paucifloris 1·5 poll. longis, pedunculis  $\cdot 2$  poll., pedicellis  $\cdot 5$  poll. longis, bracteis  $\cdot 2$ – $\cdot 25$  poll. longis. *Calycis* tubo  $\cdot 1$  poll., limbo  $\cdot 35$  poll. longo, dentibus  $\cdot 15$  poll. longis. *Corolla*  $\cdot 65$  poll. longa.

This remarkably distinct species is separable from all hitherto described *Agapetes* by its large bracts and its large calyx-limb, the teeth of which are not partite to the disk as in our other species. It may be taken therefore as the type of a distinct section (§ *Holocalyx*) to be distinguished as follows from the other sections defined in the *Genera Plantarum* ii. 571:—

§ *Holocalyx*. *Corolla* elongata recta parum ventricosa breviter

5-fida lobis erectis. Stamina recta antherae dorso calcaratae. Bracteae majusculae, calycis limbus in dentibus 5 prorsus haud solutus.

DESMOBYNE KING & PRAIN.

*Calycis* tubus teres pedicelli apice ampliato crateriformi involutus subglobosus; limbus magnopere ampliatus late campanulatus, margine integer, persistens. *Corolla* tubulosa anguste infundibularis, elongata, tubo terete recto breve 5-lobo, lobis erectis. *Stamina* 10, epigyna, corolla aequilonga filamentis glabris basi inter se et a tubo corollae liberis; antherae elongatae rectae liberae dorso muticae tubulis connatis tenuibus strictis membranaceis, loculis extus muriculatis. *Ovarium* 5-loculare; stylus filiformis stigmatate lobulato; ovula in loculis singulis numerosa placentis angulo interiori adnatis.—Frutices epiphytici, foliis alternis persistentibus breviter petiolatis coriaceis integris. Species singula, montium Indiae transgangeticae incola.

23. DESMOBYNE NERIIFOLIA King & Prain; frutex epiphytica, ramis glabris gracilioribus. *Folia* alterna oblongo-lanceolata apice longe caudato-acuminata basi rotundata breve petiolata margine integra, crasse coriacea nervis mediano subtus prominente supra impresso excepto obscuris. *Inflorescentia* corymbosa pedicellis versus apicem pedunculi sursum incrassati in axillis bractearum triangularum approximatis; pedicellis sursum incrassatis apice cupularibus. *Calycis* tubus globosus in fundo epicalycis articulatus eoque involutus, limbus inflatus late campanulatus margine integer prorsus prominenter reticulatus. *Corolla* elongata recta infundibuliformis 5-loba, lobis brevibus triangularibus. *Stamina* 10, epigyna libera filamentis brevibus antheris elongatis erectis apicibus corollae limbum attingentibus, dorso muticis. *Ovarium* 5-loculare, stylo filiformi apice breviter 5-lobulato; ovulis numerosis. *Fructus* ovatus calycis limbo persistente coronatus.

BURMA: in montibus Chin etiam in montibus Kachin, *Kingii mercenar.* !

*Folia* 4-6 poll. longa .7-9 poll. lata; petiolis .2 poll. *Pedunculi* axillares ad 2.5 poll. usque longi, bracteis triangulis .1 poll. longis, pedicellis 1.2 poll.; *calycis* tubo .15 poll. longo, limbo .3 poll. longo latoque. *Corollae* tubo 1.5 poll. longo, limbo .5 poll. diam., lobis .2 poll. longis. *Fructus* .4 poll. longus, .35 poll. diam.

A very distinct species of the group of *Vacciniaceae* that constitutes the "genera" *Agapetes* G. Don., and *Pentapterygium* Klotzsch. From all *Pentapterygia* it differs in having the calyx neither winged nor ridged and while agreeing with *Agapetes* in having a smooth calyx tube it differs from all the known species of that genus in having the calyx-limb large, entire and widely campanulate, and, further,

in having the calyx-tube enveloped by the expanded cupular apex of the pedicel. With reference to this last character the name *Desmogyne* (δεσμός, a bandage; γυνή) has been applied to the plant. We feel inclined to think that *Agapetes* and *Pentapterygium*, which are distinguished solely by the absence from the former, the presence in the latter, of ribs or wings to the calyx, are hardly separable as genera. If these two could be united our plant would then be the type of a section *Desmogyne* within this enlarged *Agapetes*. But seeing that in the three most authoritative treatises on the genera of plants—the *Genera Plantarum*, the *Histoire des Plantes*, and the *Natürlichen Pflanzenfamilien*,—Messrs Bentham and Hooker, Baillon, and Drude have considered it necessary to keep *Pentapterygium* apart from *Agapetes*, we are constrained to give our *Desmogyne*, at least for the present, the rank of a genus; it differs more markedly from either *Agapetes* or *Pentapterygium*, than these two differ from each other. The undivided calyx-limb, at first sight a more remarkable feature than the ball and socket arrangement at the apex of the pedicel is not really so important a difference as it appears; the species immediately preceding this (*Agapetes Pottingeri* Prain) stands intermediate as regards calyx-limb between this and the other *Agapetes* since the limb though 5-lobed at the margin is there also campanulate and gamophyllus below.

Dr. Stapf who has examined and kindly compared one of our specimens at Kew agrees with us in thinking that so long as *Pentapterygium* is kept apart from *Agapetes* our plant had better receive generic rank. If *Pentapterygium* could only be reduced to *Agapetes* the present species would probably have to be included in this enlarged genus as *Agapetes Desmogyne* King & Prain.

#### PRIMULACEÆ.

24. *LYSIMACHIA EVALVIS* Wall. in *Roxb. Flor. Ind.* ed. Carey & Wall. ii. 27 VAR. *grandifolia* Prain; *folia* 6 poll. longa, 2.25 poll. lata; *pedunculi* 2 poll. longi.

In montibus KACHIN, apud Neochawng 2,500 p. s. m., *Pottinger*!

This may prove, when more completely represented, to be a distinct species.

#### SOLANACEÆ.

25. *SOLANUM FEROX* Linn. *Sp. Pl.* ed. ii. 267 VAR. *inermis* Prain; omnino nisi aculeis absentibus cum *S. feroce* convenit.

In montibus KACHIN nuncupatis, *Kingii mercenar.*!

The collector's note is "Moima villge; flowers white." There is not a character whereby the plant can be separated from *S. ferox* except

the complete absence of any trace of prickles whether on leaves or stems, and in the less numerous needle-like hairs on the fruits.

It is well-known that many forms of *S. Melongena* under cultivation entirely lose their armature; it is interesting to find that the same may apparently happen with a wild species like *S. ferox* when growing as a weed in the rich soil that characterises the vicinity of an Indian hill-village.

#### GESNERACEÆ.

26. *AESCHYNANTHUS GRANDIFLORA* Spreng. *Syst. Veg.* iv. 238 VAR. *longiflora* Prain; floribus 2·25 poll. longis, ceterum typi.

In montibus KACHIN, *Kingii mercenar.*!

27. *AESCHYNANTHUS MICRANTHA* Clarke in *Flor. Brit. Ind.* iv. 340 VAR. *Pottingeri* Prain; capsulis 10-pollicaribus, ceterum omnino typi.

In montibus KACHIN, *Kingii mercenar.*!

Quite possibly both these *Aeschynanthi*—of which the first is only reported in flower, the second only in fruit—may prove when fully represented to deserve specific rank.

28. *AESCHYNANTHUS PUSILLA* Prain; rami elongati gracillimi, sparse pilosi, nodibus prorsus radicanes, *foliis* ternatis parvis ovatis apice acutis, basi cuneatis, 3 poll. longis 2 poll. latis utrinque pilis albidis multicellularibus villosis, nervis obscuris, margine integris petiolis distinctis (15 poll. longis), villosis; *floribus* paucis terminalibus et in axillis superioribus, ad nodos singulis, pedicellis gracilibus, 2 poll. longis, dense pilosis; *calyce* 5-partito, segmentis lanceolatis tuboque anguste campanulato pilis patentibus dense villosis; *corolla* extus parce puberula, pallide flava limbum versus viridescente, lobis ipsis intus tantum purpurascens, tubo 1 poll. longo dimidio inferiore peranguste cylindrico, dimidio superiore anguste infundibuliformi, limbo 2 poll. lato; filamentis inclusis filiformibus glabris; *capsula* adhuc ignota.

In montibus KACHIN nuncupatis; *Kingii mercenar.*!

This graceful little species may be tentatively referred to the section *Haplotrichium*, its general facies indicating that it is probably closely allied to *Aeschynanthus gracilis*; till fruiting specimens are obtained, however, its precise position must remain problematical.

29. *DIDYMOCARPUS ELATIOR* Prain; suffrutescens; rami juniores pilis divergentibus rufescentes demum glabrati; *folia* ovato-lanceolata basi cuneata apice acuminata margine minute serrata, petiolata, petiolis rufo-pubescentibus, laminis supra parce adpresse puberulis subtus præsertim nervis pubescentibus; *cymæ* paucifloræ axillares pedunculis gracilibus elongatis puberulis; bracteæ lanceolatae; pedicelli calyce

parum longiores saepius singuli; *calyx* campanulatus ad medium usque fissus dentibus ovato-acutis tubum aequantibus; *corolla* tubulosa fere recta extus parcissime puberula, subsymmetrica, pallide purpurea; *capsula* in pedicello erecta.

In montibus KACHIN, apud Sim, 5,000 p. s. m., prope rivulis; *Kingii mercenar.*!

*Foliorum* laminis 3 poll. longis, 1·25–1·5 poll. latis, petiolis ·75 poll. longis; pedunculis 1·5 poll. longis saepius 3-floris, nonnunquam (floribus lateralibus geminis) 5-floris; pedicellis ·4 poll. longis; *calyce* ·25 poll. longo; *corolla* 1·2 poll. longa; *capsula* 1–1·25 poll. longa ·15 poll. lata.

A very distinct species, in habit most resembling *D. corchorifolia* Wall., from Penang and Malacca.

#### ACANTHACEÆ.

30. RHINACANTHUS CALCARATUS *Nees* in *Wall. Pl. As. Rar.* iii. 109 VAR. *maxima* *Prain*; *foliis* utrinque parcissime puberulis, panicula condensata; *corollae* tubo 1·5 poll. longo; *capsula* 2 poll. longa.

In montibus KACHIN, *Kingii mercenar.*!

This will probably have to be considered a distinct species, *Rhinacanthus maximus*, when full material of the original species is obtained; as yet the fruit of *Nees'* plant has not been collected. The present plant has leaves that are exactly like those of the type in size and texture; they only differ in being faintly puberulous on both sides, those of *Nees'* plant being glabrous; its calyx and corolla are exactly like those of *Wallich's Pl. As. Rar.* t. 113 except that they are distinctly larger.

#### HAEMODORACEÆ.

31. OPHIOPGON CORDYLINOIDES *Prain*; caule rigide erectiusculo, crasso, nodis nec radicante, vaginibus ovatis viridibus margine late scariosis mox deciduis suffulto, *foliis* late lanceolatis acuminatis 15–17-nervis, petiolis angustis brevibus basi vaginis scariosis expansis, *scapis* quam folia fere dimidio brevioribus, bracteis scariosis, pedicellis vix longioribus, *floribus* fasciculatis, albidis, quam pedicellos brevioribus, segmentis ovato-oblongis, antheris lanceolatis filamentis brevissimis, stylo filiformi; *fructu* orbiculari.

In montibus KACHIN, apud Namli, 2000 p. s. m., *Pottinger!* *Kingii mercenar.*!

Caulis penna cygni crassus, foliis 8–12 poll. longis, ·75–1 poll. latis, petiolis vix 1 poll. longis. *Racemi* 3–4 poll. longi, bracteis ·3 poll. longis, pedicellis 25 poll. longis, *perianthio* ·2 poll. longo, ·3 poll. lato; *fructu* ·2 poll. diam.



A very distinct species with an elongated stem as in *C. dracaenoides*, but without roots at the nodes whence arise the tufts of leaves; the vaginal sheaths are exactly as in *C. dracaenoides* but the leaves proper are longer and narrower and have shorter petioles. The flowers are much as in *C. dracaenoides* but are slightly smaller; the fruits are considerably smaller.

#### LILIACEÆ.

32. *DISPORUM PULLUM* *Salisb. Trans. Hort. Soc. i. 330.* VAR. *oblanceolata* *Prain*; *foliis* oblanceolatis, acuminatis, 8 poll. longis 2·5 poll. latis, fasciculis circa 15-floris, pedicellis 1·25 poll. longis, *fructibus* ovatis subacutis 2 poll. longis.

In montibus KACHIN, apud Lammuk, *Pottinger*!

This is unfortunately only represented by one specimen which is without flowers. It is obviously most nearly related to *D. pullum* of which it is for the moment treated as a variety, though there is hardly room for doubt that when more fully represented it must be considered a distinct species.

#### COMMELYNACEÆ.

33. *STREPTOLIRION VOLUBILE* *Edgew. Trans. Linn. Soc. 90 t. 2.* VAR. *setosa* *Prain*; *caulibus*, *petiolis*, *foliorum* *marginibus*, *pedicellis*, *bractearumque* *marginibus*, pilis fuscis rigidioribus deusius setosis; *ceterum* *typi*.

In montibus KACHIN; *Kingii mercenar.*!

The setose stems, petioles and leaf margins give this plant a very distinctive facies, but it cannot be separated by any other character from typical *S. volubile*, which is likewise sent by the same collector from the Kachin Hills, and it will probably be found unnecessary to accord this more than varietal rank.

#### AROIDEÆ.

34. *TYPHONIUM INOPINATUM* *Prain*; *foliorum* *petiolis* quam lamina triplo longioribus; lamina ovata apice acuta base sinu latiore cordata; *pedunculo* *petioli* partem vaginalem fere aequante; *spathae* tubo sub-orbiculari quam lamina prorsus suberecta sensim acuminata sexties brevior; tubo utrinque viridi, limbo viridi extus basi lineatim obscure purpurascente intus basi lineis sursum maculis purpureis notato; *inflorescentia* foeminea fertili quam mascula multo brevior, pistillodiis perpaucis simplicibus vel bifurcatis parum recurvis; *spadicis* appendice tereti anguste conoidea vix stipitata reliquam spadicis partem parum excedente.

In BURMA superiore prope Myitkyina, *Kingii mercenar.*!

*Foliorum* petioli 1·5–2 dm., pars vaginalis 4–5 cm., lamina aequae 8 cm. longa lataque, sinu aequae 2 cm. lato altoque. *Pedunculus* 4–5 cm. longus, spathae tubus 2 cm. longus, 1·5 cm. latus, limbus 9–10 cm. longus, triente imo 4·5 cm. latus apice subacutus. *Inflorescentia* mascula cylindrica pallidiflora 1 cm. longa ·45 cm. lata, antherarum thecae rimis porosis apertae; pars foeminea pallide punicea ·2 cm. longa ·5 cm. lata, pistillodiis basi purpureis medio albis apice viridescentibus explanatis ·5 cm. longis. *Inflorescentia* tota 8 cm. longa, parte sterili 5 cm. longa. *Fructus* baccatus viridis pallide rubro-suffusus, ovalis, ·5 cm. longus, ·4 cm. diam.

This interesting species was first noticed in Oct. 1895, in one of the flower-beds in the Royal Botanic Garden, in which it had appeared spontaneously. A drawing was made and sent with specimens to Kew, where it was examined by Mr. N. E. Brown, of the Kew staff, a very able student of *Aroidæ*; Mr. Brown agreed with us in thinking it new. No light could be thrown, at the time of its first being noticed, on its original habitat, though its introduction had apparently not been recent, seeing that it was subsequently found, when looked for, in almost every part of the Botanic Garden. The communication of specimens from Myitkyina in Northern Burma seems at last to definitely settle the original source of the species. It is noteworthy that the commonest of the *Typhonias* in and around the Royal Botanic Garden, *Typhonium trilobatum* Schott (*Arum trilobatum* Linn. = *Arum orixense* Roxb.), is evidently a plant introduced here during or since Roxburgh's incumbency as Superintendent (1793–1815). Roxburgh did not collect it in Bengal and we have been unable to find it in Bengal ourselves, or to learn that any one has found it in Bengal except in the immediate neighbourhood of these Gardens—where it is scarce, and inside them—where it is abundant. Next most common in these Gardens is *T. inopinatum*, the species just described, while fairly plentiful but less common than either is a species that during Roxburgh's superintendentship was accidentally introduced from the Moluccas, and that he has described as *Arum trilobatum* in *Flora Indica*, iii. 505, but that is not the *Arum trilobatum* of Linnaeus, *Sp. Pl.* ed. princeps, though it was included by Linnaeus with the true *T. trilobatum* in his *Systema* ed. x. and his *Sp. Pl.* ed. ii. The true *Typhonium trilobatum* is based on a figure by Hermann (*Par. Bat.*) of the Ceylon "Panuala" which Thwaites, Trimen and others identify with *Arum orixense* Roxb. whereas Roxburgh's plant is the same as Rumphius' *Arisarum amboinicum* (*Herb. Amboin.* V. t. 110, f. 2). It is usual to give the name *Typhorium Roxburghii* to Roxburgh's plant, on the authority of Schott, but there is a slight objection to this in the fact that Schott gives a figure of the plant which he names *T. Roxburghii*

and which he takes to be Roxburgh's one, but which differs altogether from Roxburgh's in habit, in length of peduncle (twice instead of half as long as vaginal portion of leaf-stalk), size of spathe, nature of pistillodes, distance between male and female portions of inflorescence and space between male inflorescence and barren appendix. This misidentification is the more inexplicable since Roxburgh has left a very accurate coloured drawing of the plant intended by him, a drawing that has been copied by Wight as his  *Ic. t. 803*, and since Schott himself expresses a doubt whether the plant which he figures as *T. Roxburghii* be the same as the *Arisarum amboinicum* Rumph. V., t. 100 f. 2, with which Roxburgh identified his plant. The coloration of the plant figured by Saunders (*Ref. Bot. t. 283*) closely approximates to the true Roxburghian plant, but the tip of the spathe does not twist as in *T. Roxburghii*, the plant which Roxburgh figures. The tip of the spathe does not twist in the figure given by Rumphius though the account given of the colour in the *Herb. Amboinense* agrees well enough, and for the matter of that, the tip does not always twist in the plant as it grows; the chief objection to Rumphius' plant being ours is that its peduncle is much too long. What makes matters more complicated is that we have yet another species of *Typhonium* which grows, as if wild, in the Royal Botanic Garden, and which has all the characters of the plant that Schott figures. This species, for the writer is inclined to treat it as a distinct plant, has a white barren appendix in place of the bright red or terracotta coloured appendices of *T. trilobatum* and *T. inopinatum* or the dark purple very long and slender appendix of Roxburgh's plant from the Moluccas. Perhaps the simplest solution of the tangle is to quote the Moluccas plant as *Typhonium Roxburghii* Schott (as to citation *T. trilobatum* Roxb.) *Aroid. i. 12* (excl. t. 17), *Prodr. 106* (*in part*); Saunders, *Ref. Bot. t. 283* = *Arum trilobatum* Roxb. *Flor. Ind. iii. 505*; Wight,  *Ic. t. 803*; and to cite the hitherto unnamed and undescribed Botanic Garden species which Schott has figured, as a new species, *Typhonium Schottii* Prain = *T. Roxburghii* Schott *Aroid. t. 17* (excl. *descript.*). A reference to the original works will show that in his *Prodromus*, Schott describes the coloration of *T. Roxburghii* in terms that are only applicable to Roxburgh's Moluccan plant, and says that the description is based on dried specimens and drawings; in his *Aroid-deæ*, Schott does not venture to describe colours and it may be safely assumed from this that both the description and the drawing are from dried specimens only. Even if in both instances the description may be held to include Roxburgh's plant, yet the drawing is certainly that of another species. As yet we have been unable to find where *T. Schottii* is really wild. The only truly wild and un-introduced species in Lower Bengal is

*T. cuspidatum* Bl., and curiously enough this happens to be much the rarest of the five that are to be found within the limits of the Gardens. We have been unable to find it noted that the otherwise excellent figure which Blume gives of *T. cuspidatum* makes the curious mistake of reversing the position of the lower pistillodia. These are cymbiform organs with the concavity directed upwards in the natural state; in Blume's figure the concavity is made to look downwards.

Before leaving this subject it may be pointed out that though Roxburgh has cited Loureiro's *Arum trilobatum* as equivalent to his *A. orixense*, this is by no means clearly the case. The pistillodia of *A. orixense* (the true *A. trilobatum*) are, as Roxburgh describes them, yellow; those of *A. trilobatum* Loureiro, are described, on the other hand, as red. The truth is that the genus *Typhonium* requires more careful and extended study, from living plants, than it has yet received.

35. *TYPHONIUM LISTERI* Prain; *foliorum* petiolis quam lamina dimidio longioribus; lamina pedatisecta 5-foliolata, segmentis mediano sessili reliquis per paria breve petiolulatis omnibus anguste ovatis basi cuneatis apice sensim acuminatis; *pedunculo* purpureo brevissimo bracteis cataphyllariis obtecto; *spathae* tubo subcylindrico quam *spatha* subito refracta quadruplo brevior; tubo extus laete viridi intus lutescenti, limbo extus margine purpurea excepta laete viridi intus purpurascens; *inflorescentia* foeminea fertili quam mascula parum tantum brevior, pistillodiis paucioribus majusculis ligulatis deflexis purpureis; *spadicis* appendice tereti parum stipitata basi plus minus obliqua concolore lactea, abrupte refracta et *spathae* limbo involuta reliquam *spadicis* partem triplo longiore.

In prov. CHITTAGONG; *Lister!* in ASSAM; *Watt!*

*Foliorum* petioli 2·5–3 dm. longi, pars vaginalis 1·5 cm., *cataphyllis* *spathaceis* 3–7 cm. longis; *laminae* segmentis 1·4 dm. longis, 6 cm. latis. *Pedunculus* vix 1 cm. longus, *spathae* *tubus* 4 cm. longus, 2 cm. latus, limbus angulo angulum rectum parum excedente refractus 1·4 dm. longus, 7 cm. latus apice acutus. *Inflorescentia* mascula cylindrica 1·7 cm. longa, 9 cm. lata, pars foeminea conica 1 cm. longa, basi 1·5 cm. lata; parte sterili 1·2 dm. longa, 1·2 cm. lata.

A very distinct species.

36. *TYPHONIUM POTTINGERI* Prain; *foliorum* petiolis quam lamina duplo longioribus, lamina profunde tripartita partitionibus subaequilongis intermedia oblongo-elliptica acuta, lateralibus oblongo-lanceolatis, lobo triplo brevior oblongo-obtusosubretusos auctis; *pedunculo* quam petioli pars vaginalis duplo brevior; *spathae* tubo ovato vel oblongo quam lamina imo tertio ovata erecta sursum recurva et sensim longe acuminato-caudata octies brevior; tubo extus viridi intus rubescente,

limbo basi tantum intus rubescente supra puniceo-maculata extus colore pallide viridi; *inflorescentia* foeminea fertili quam mascula multo brevior, pistillodiis numerosissimis varie flexis; spadicis appendice tereti anguste conoidea breviter stipitata reliquam spadicis partem magnopere excedente.

In montibus KACHIN, prope Myitkyina, *Kingii mercenar.!*

*Foliorum* petioli 2-2.5 dm., pars vaginalis 2.5-3 cm., laminae partitiones .8-1.2 dm. longae .75-1 dm. latae, lobi lateralium basales 4-6 cm. longi, 3-4 cm. lati. *Pedunculus* 1-1.5 cm. longus; spathae tubus 3 cm. longus, 2.5 cm. latus limbi pars triens inferior 7 cm. longa, 9 cm. lata pars summa caudata reflexa basi 3.5 cm. lata, 1.4 dm. longa, sensim apice longe acuminata attenuata. *Inflorescentia* mascula cylindrica rubra 1 cm. longa .7 cm. lata antherarum thecae rimis porosis apertae; pars foeminea alba .5 cm. longa, .85 cm. lata, pistillodiis albis explanatis 1.2-1.5 cm. longis. *Inflorescentia* tota 4 dm. longa, appendice sterili 16 dm. longa.

In addition to the forgoing *Aroidæ*, an undescribed *Amorphophallus*, which has been included in a *List of Kachin Plants*, published in the *Records of the Botanical Survey of India* as *A. Cruddasianus*, should be here alluded to. Complete material has been sent by our Garden Collector, but for the moment we prefer to withhold a detailed description till living flowers are available, when an accurate account of the coloration can be given. Our collector has sent also a number of living tubers, but during the past season these have sent up leaves only. The tubers alone, however, furnish characters that are sufficiently diagnostic; in place of being oval or depressed, as in other *Amorphophalli* hitherto described, these in *A. Cruddasianus* are long and parsnip-shaped, 6-10 in. long, 2-3 in. across the top.

*New species of Entada from Singapore and Borneo.*—By H. N. RIDLEY, Esq., M.A., F.L.S., *Director, Botanic Gardens, Singapore.* Communicated by SURGEON-MAJOR D. PRAIN.

The genus *Entada* is represented in the Malay Peninsula by the well-known *E. pursaetha*, and a species very common in Singapore which seems to have been entirely overlooked, although it is very conspicuous here from its very remarkable fruit. To this plant I propose to give the name *Entada spiralis*.

*E. SPIRALIS*, n. sp. A woody climber with twisted somewhat flattened spiral stems about 3 in. wide and 1-2 in. thick in the thickest part in large specimens; thinner on the outer edge of the curve. *Leaves* alternate three inches long (excluding the tendril), petiole one

inch, much swollen at the base, pinnæ four alternate with petiolules one inch long swollen at base, leaflets alternate rarely opposite, somewhat distant, with very short stalks elliptic to obovate-oblong retuse inaequilateral, 2 to 3 in. long, 1 in. or less wide, dark green unpolished above, glaucous beneath, tendril long, bifid at the apex. *Flower-spikes* axillary 6 in. long, peduncle 2 in. long, swollen at base, rachis purplish-brown covered with short stiff hairs. *Bracts* minute lanceolate hairy. *Flowers* copious densely crowded, shortly pedicellate. *Calyx* campanulate with five teeth, hairy, green. *Corolla*-lobes 4 or 5, oblong obtuse glabrous green, 2 mm. long. *Stamens* 8 to 10, at first white soon becoming yellow, filaments  $\frac{1}{4}$  inch long filiform; anthers globose terminal. *Ovary* cylindrical oblong; *style* about as long as the stamens, stigma concave.

The pods are crowded together, three or four being produced on a peduncle. They are contorted into a spiral all coiled together, with five to eleven seeds in each pod. The margins are undulate, and not thickened, and the walls are not woody and remain always green. When ripe the pod breaks up into joints which as they fall delisces.

The seeds vary much in size; they are obscurely triangular in outline or heart-shaped. The larger ones are about two inches long and broad and an inch thick. The testa is chocolate-brown, dull and less woody than in *E. scandens*. The plant is very abundant in Singapore and I have also seen it in Province Wellesley. It usually grows in loose scrub on the edges of woods, or among secondary growth. It constantly throws up shoots from the roots, and is a troublesome plant to eradicate. The shoots are of a purple black colour. The flower-spikes are usually produced immediately after the fall of the leaves, in December or January, but by the time the flowers are open the plant is clad again in leaves. The period of flowering, however, is rather irregular and flowers may often be met with at other seasons. The flowers are fertilized by *Diptera*, chiefly *Syrphidæ*. A good proportion of them possess no pistil, but are entirely male. The seed is dispersed chiefly by monkeys which eat portions of the pods, and throw the seeds about.

The plant is called Akar Beluru by the Malays, as is also *E. Pursaetha* DC.

*E. PURSAETHA*, DC. described by Dr. Prain (J. A. S. B. lxvi. 2. 242) under the name of *E. scandens* Benth. is a much less common plant in the Malay Peninsula. I have only met with it in Pahang. The plant described and figured by Scheffer under the name *Eutada Rumphii* (Nat. Tijds. Ned. Ind. xxxii. t. xvii. xviii. B) seems to me to differ in the form of the pod only. The foliage of *E. Pursaetha* seems to vary very much as does that of *E. spiralis*, and were it not for the fruit I should

certainly refer the plant from Pahang to *E. Rumphii* as the fewer large leaflets quite resemble those of Scheffer's figure; the pod, however, exactly resembles one from the Andamans collected by Dr. Prain and is also exactly like the figure of *E. Pursaetha* given by Scheffer.

In examining specimens of *E. Pursaetha* in the Herbarium of the Botanic Gardens, Singapore, and those lent me kindly by Dr. Prain, I note a form in which the rachis of the inflorescence and the petiole and midrib of the leaf are covered with a rather conspicuous tomentum, reddish in the dry specimen, while the rachis in the other forms is much more glabrous, though by no means completely so. These specimens were collected in the Chittagong Hill Tracts (*Lister* 175), Manipur (*Watt* 6726), Silhet (*Wullich*), and Sikkim (*Thomson*), and probably represent a local form. However, I have seen no fruit.

The species from the Indian region and Malay Peninsula then are *E. Pursaetha* DC, and *E. spiralis* n. sp. Further east we get *E. Rumphii* Scheff. distinguished by its straight pod with oblong not rounded joints, with a straight and not indented thickened margin, oblong seeds, and thinner endocarp. I have also an evidently distinct species collected by Dr. Haviland in Sarawak on two occasions of which I have seen no fruit, which I will describe under the name of *E. borneensis*.

*E. BORNEENSIS*, n. sp. *Leaves* 4 in. long, with 6-7 pairs of leaflets opposite or in the lower part of the leaf, alternate, oblong retuse, slightly oblique, coriaceous dark shining above, when dry glaucous beneath, petiole  $\frac{1}{8}$ th in. long, pubescent, midrib on both sides of the leaf pubescent, 1 in. long, and  $\frac{5}{8}$ ths in. wide; tendrils two on each leaf.

*Inflorescence*, one foot to one foot and a half long covered with closely appressed pubescence. *Flowers* densely crowded, much smaller than in the other species. *Calyx* cupulate with very short teeth, pubescent. *Corolla* 5-lobed, lobes lanceolate acute. *Stamens* ten, filaments as in *E. Pursaetha*; anthers oblong. *Pistil* very rudimentary; female flowers and fruit not seen. Borneo, Sarawak, at Penkulu Ampat (374), Saribas (1563, Haviland).

This species is certainly most nearly allied to *E. spiralis* in its opposite leaflets glaucous beneath, but is very distinct in having from six to seven pairs, smaller, and pubescent on both sides of the midrib, in the very much longer spikes of flowers which are not more than half the size of those of *E. Pursaetha* or *E. spiralis* and the flower spikes being unisexual. Dr. Haviland notes also that all the specimens are male. The corolla in this species opens out quite flat starwise, not merely reflexing its petals as in the other kinds, which gives it a very different appearance. It is to be hoped that further explorations in Sarawak will produce female flowers and fruit.

*On a small collection of Butterflies from Buru in the Moluccas.*—By LIONEL DE NICÉVILLE, F.E.S., C.M.Z.S., &c.

[Received 25th June; Read 3rd August, 1898.]

As far as I am aware, no list has been published on the butterflies of Buru. As local and in especial insular lists of fauna are of particular interest for distributional and other reasons, I have thought it advisable to prepare the list given below. The material on which it is based is small, and consists of but few examples of each species. It is not known to me into whose hands the bulk of the collection has fallen. The specimens were collected early in 1897 (he visited the island a few years previously) by Mr. William Doherty, aided by native (Indian) collectors, and are labelled as from Kayeli. This place is marked Kajeli in my Dutch maps, and lies to the north-east of the island, and there is a district, fort, and deep bay of this name. In English the fort is sometimes written Cayeli. The island of Buru (Boeroe in Dutch, Bouru in German, Bourou in French) is one of the largest of the Moluccas or true Spice Islands, and it lies a little south of the equator, between 3° and 4° S. Lat., and 126°–127°20' E. Long. East of Buru is the large island of Ceram, with the small Amboina or Ambon group of islands to the south-west of Ceram again; west of Buru is the very large island of Celebes. Buru has the Ceram Sea to the north and the Banda Sea to the south. In shape it is a very regular oval with its longer axis lying parallel with the equator, it is about 85 miles in length by 40 in breadth, and has an area of nearly 2,000 square miles. The northern portion of the island produces the plant from which is extracted the far-famed Cayaput or Cajaput-oil; and that curious mammal, the Babirusa, is found in the island as well as in Celebes.

Reference is made below to all such species recorded from Buru of which I have been able to find records. In the entomological portion of 'The Voyage of the Astrolabe' Dr. Boisduval records 23 species from Bourou. Dr. A. R. Wallace in his *Pieridæ* of the Indian and Australian Regions gives 16 species, and in his Notes on Eastern Butterflies records one species of the subfamily *Elymniinæ* and five of the *Nymphaliniæ* from Bouru. Those species not seen by me have an asterisk prefixed to their names. The present collection consists of 93 species only, of which I have not seen 29.

## Family NYMPHALIDÆ.

### Subfamily DANAINÆ.

1. \*HESTIA (*Nectarina*) AZA, Boisduval.

Bourou (*Boisduval*), Bouru (*Moore*). In my collection from Ternate and Gilolo,



2. \*DANAIS (*Radena*) SOBRINA, Boisduval.

Bourou (*Boisduval*). Recorded only from the Aru Isles and New Guinea by Moore. I have it from Ternate and New Guinea.

3. DANAIS (*Radena*) MEGANIRA, Godart.

In my collection from Ceram and Amboina.

4. \*DANAIS (*Radena*) JUVENTA, Cramer.

Bourou (*Boisduval*). A doubtful record I think.

5. DANAIS (*Nasuma*) ISMARE, Cramer.

In my collection from Amboina.

6. DANAIS (*Ravadeba*) LUTESCENS, Butler.

Described from Ceram and Bouru by Dr. Butler. Recorded also from Batchian by Moore.

7. \*TELLERVO ASSARICA, Cramer.

Bourou (*Boisduval* as *Hamadryas assaricus*, sic!).

8. \*EUPLŒA (*Vadebra*) MELINA, Godart.

Bourou (*Boisduval*). Recorded from Ceram and the Aru Isles by Moore.

9. EUPLŒA (*Gamatoba*) MELANCHOLICA, Butler.

Originally described from Bouru and Amboina. My specimens agree very well with Mynheer P. C. T. Snellen's figure of this species in *Tijd. voor Ent.*, vol. xxxii, p. 381, pl. viii, fig. 2, *male* (1889), as *E. melancholica*, var. *æthiops*, Butler, described by Butler as a distinct species from Waigiou. Snellen's specimens were from Roon Island. My Buru specimens are fairly constant, none of them have any spots on the upperside, this feature being characteristic of the var. *æthiops*. Unfortunately Dr. Butler did not figure either species. Mr. Moore keeps them distinct.

10. \*EUPLŒA (*Gamatoba*) ALCATHOË, Godart.

Bourou (*Boisduval*). Mynheer P. C. T. Snellen in *Tijd. voor Ent.*, vol. xxxv, p. 1, n. 1 (1892), has pointed out that the *E. alcathoë* of Moore is not the same species as the *E. alcathoë* of Godart, the true *E. alcathoë* probably being an older name for *E. melancholica*, Butler. "*Danaïs*" *alcathoë* was originally described from Amboina.

11. \*EUPLŒA (*Gamatoba*) SPICULIFERA, Moore.

Bouru (*Moore*).

12. *EUPLEA (Betanga) DUPONCHELII*, Boisduval.

Originally described from Bourou. In my series of specimens from Buru the spots on the underside vary greatly in size and number, one extreme has four spots on the forewing and ten on the hindwing, the other has twenty and thirty-one respectively. I have this species also from Ceram.

13. \**EUPLEA (Chiroa) LAPEYROUSEI*, Boisduval.

Described from Vanikoro by Boisduval, recorded from Bouru by Moore, who has examined the type specimen in M. Charles Oberthür's collection.

14. *EUPLEA SEMICIRCULUS*, Butler.

Recorded from Bouru, Amboina and Gilolo by Moore. I have only females from Buru. They are very richly shot with purple on the upperside in some lights.

15. \**EUPLEA (Salpinx) LEUCOSTICTOS*, Gmelin.

Boisduval from Bourou as *E. eunice*, Godart.

16. *EUPLEA (Salpinx) BOURUANA*, Moore.

Bouru (*Moore*). A good series of both sexes. As usual the number and size of the spots shews much variation. The MALE (hitherto undescribed) differs from the female in having the usual secondary sexual characters of the subgenus *Salpinx*; the UPSIDE of the forewing has the bowed-out portion of the inner margin paler than the rest of the wing, the bluish-white spot in the submedian interspace is smaller, single and round, in the female it is double; the hindwing has the abdominal margin broadly paler than the rest of the wing, the submarginal series of spots greatly reduced in size or absent altogether; on the UNDERSIDE of the forewing the spots on the disc are rich violet-blue, as are all the spots on the hindwing, in the female these spots are white.

17. \**EUPLEA (Salpinx) HISME*, Boisduval.

Bourou (*Boisduval*). Mr. Moore records it from the Aru Islands only, while Dr. Boisduval gives it only from Bourou.

18. \**EUPLEA (Stictoploea) WATSONI*, Moore.

Bouru (*Moore*).

## Subfamily SATYRINÆ.

19. *MYCALESIS (Orsotriæna) MEDUS*, Fabricius.

Hewitson as *Mycalesis hesione*, Cramer, from Bouru. My specimens

have the discal white line across both wings on the underside very narrow, becoming obsolete; all the ocelli well-developed,

20. MYCALESIS (*Calysisme*) PERSEUS, Fabricius.

A single quite normal male received, of the wet-season ocellated form.

21. MYCALESIS (*Mydosama*) REMULIA, Cramer.

Bouru (*Hewitson and Moore*).

22. MYCALESIS (*Mydosama*) SIRIUS, Fabricius.

Described from Amboine, Bourou and Offack by Boisduval as *Satyrus manipa*. Hewitson records it from Bouru as *Mycalesis manipa*. Moore as *Mydosama manipa* from Bouru.

23. LETHE ARETE, Cramer.

Hewitson as *Debis europa*, Fabricius, var. *arete*, Cramer, from Bourou. Mr. Moore in *Lep. Ind.*, vol. i, pp. 256, 270 (1892) says that *L. arcuata*, Butler, from Celebes, is quite distinct from *L. areta* from Sula and Amboina. My Buru specimens of both sexes have the upperside beautifully glossed with plumbeous coloration, which doubtless quickly fades in cabinet specimens.

24. YPTHEMA ASTEROPE, Klug.

The wet-season form, with well-developed ocelli on the underside, only obtained.

25. MELANITIS LEDA, Linnæus.

Hewitson records this species from Bouru as *Cyllo leda*. I have six males, which are remarkably constant. The upperside of both wings is deep ferruginous, darker on the hindwing; the ochreous band within and anterior to the subapical ocelli of the forewing is well-defined; there are two ocelli towards the anal angle of the hindwing; the underside is richly coloured and is uniform in all the specimens; the ocelli are large; the forewing has three, the hindwing one, prominent dark bands crossing the wings.

26. HIPIO CONSTANTIA, Cramer.

A good series of both sexes of this fine species.

27. HIPIO AMABILIS, Boisduval.

Hewitson as *Cyllo amabilis* from Bouru. One male and two females received. The male has two medium-sized ocelli on the underside of the forewing at the apex, the lower twice as large as the upper; the hindwing has first a very large, then two minute, then three nearly

equal-sized and rather large ocelli. One female has on the underside of the forewing at the apex one medium-sized ocellus, in the other specimen it is wanting; the hindwing has the ocelli as in the male, except that the one in the discoidal interspace is wanting in one specimen, and in the other that that ocellus and the one in the lower subcostal interspace also is absent.

Subfamily ELYMNIINÆ.

28. ELYMNIAS (*Dyctis*) VIMINALIS, Wallace.  
Originally described from Bouru.

Subfamily NYMPHALINÆ.

29. CUPHA LAMPETIA, Linnæus.  
Both sexes received.

30. ATELLA EGISTA, Cramer.  
Recorded from Bouru by Wallace.

31. CYNTHIA ARSINOË, Cramer.  
Males only received.

32. PRECIS HEDONIA, Linnæus.

A single very brightly-marked male received, with all the ocelli large and conspicuous, as in Blanchard's figure of "*Vanessa hedonia*, Fabricius," from Banda, in the *Voy. Pole Sud*, pl. ii, fig. 10 (1853).

33. JUNONIA ERIGONE, Cramer.

Males only. Cramer's figure of this species with its bright red markings on the upperside is very bad.

34. NEPTIS (*Phædyma*) HELIODORA, Cramer.

"*Papilio*" *heliodora* is the type of Felder's genus *Phædyma*. My single female from Buru has the inner edge of the discal white band on the underside of the hindwing quite straight and even, while Cramer's figure of the species, probably also taken from a female, shews the band highly irregular and uneven. Unfortunately I have no specimens from Amboyna, from whence *P. heliodora* was described, to compare with my Buru example. Mr. W. F. Kirby in the *Supplement to his Syn. Cat. Diurn. Lep.*, p. 742, n. 30 (1877), gives *N. heliodora* as a synonym of "*Papilio*" *pellucidus*, Goeze, but both species were described in the same year (1779), and as Cramer figured his species,

I prefer to use his name. Herr C. Ribbe in *Iris*, vol. ii, p. 237, n. 73 (1889), alters the spelling to "*pellucides*." Goeze's work is in none of the Calcutta libraries.

### 35. NEPTIS VENILIA, Linnæus.

Boisduval as "*Limenitis*" *venilia* from Bourou. My female from Buru differs from males from the same island in having all the white markings on the upperside larger and more conspicuous, and the blue coloration reduced. Dr. Staudinger's "*Athyma*" *venilia*, var. (ab.?) *evanesens*, from Batjan, which he has kindly sent me, appears to be a very good local race, with all the white markings much reduced, *vide* Ex. Schmett., vol. i, p. 147, pl. li, *male* (1886).

### 36. HYPOLIMNAS BOLINA, Linnæus.

Boisduval as "*Diadema*" *lasinassa*, Cramer, from Bourou. Wallace records it from every island in the Archipelago. Buru males are normal. I have three distinct forms of the female from Buru:—I, the upperside almost uniformly fuscous with no discal macular white or violet band between the second median nervule and the costa on the forewing; II, as in I, but with a deep orange patch in the submedian interspace of the forewing; III, as in I, but with the above-mentioned macular band, which is sometimes white, sometimes violet, and the outer half of the hindwing more or less bright brown; no orange patch. None of these forms have been named and figured by Cramer, though II approaches his "*Papilio*" *antigone*, and III his "*P.*" *melita*.

### 37. HYPOLIMNAS ALIMENA, Linnæus.

Boisduval as "*Diadema*" *alimena* from Bourou. Wallace as "*D.*" *alimena* from Bourou. Males only received.

### 38. HYPOLIMNAS PANDORA, Wallace.

The female only is described from Bourou by Wallace. The male has a large discal violet patch on the upperside of the forewing divided into four portions by the black veins, the posteriormost portion in the submedian interspace is small, the two portions in the median interspaces are large, the anteriormost portion in the lower discoidal interspace as small as the first-mentioned portion; except for this violet patch the forewing is unmarked; the hindwing is like that of the female, except that the discal series of oval black spots are blind, in the female they are pupilled with violet. The hindwing differs from that of *H. pandarus*, Linnæus, in entirely lacking the large discal violet patch of that species, the orange area being consequently much larger. The underside differs but slightly from that of the female; in

the forewing the outer-discal series of spots is incomplete, those in the upper median and lower discoidal interspaces being absent, and the spots are blue instead of white. Boisduval records this species from Bourou as "*Diadema*" *pipileis*, Linnæus, which is the female of *Hypolimnas pandarus*, Linnæus, restricted to Amboyna and Ceram by Wallace.

39. *HYPOLIMNAS ANTILOPE*, Cramer.

Wallace from Bourou. I have a good series of both sexes from Buru. The typical form figured by Cramer has a broad submarginal pale ochreous-white band on the upperside of the hindwing, in some specimens this band is of a deeper colour, being quite ochreous, in other examples the band is obsolete, the hindwing being almost uniformly coloured. In some specimens the submarginal series of small white spots on the upperside of the forewing is obsolete towards the apex, in others the two anteriormost spots are large and wedge-shaped. On the underside the same variations occur as on the upperside. This species is quite distinct from *H. anomala*, Wallace, from the Malay Peninsula, Sumatra, Nias, Java, Bali, Lombok, Celebes, and the Philippines. The Sambawa local race has been named *H. sumbawana* by Dr. Pagenstecher in Ent. Nach., vol. xxiv, p. 81 (1898).

40. \**PARTHENOS NODRICA*, Boisduval.

Boisduval records this species from Bourou and New Guinea as "*Minetra*" *nodrica*. I have it only from the latter island; its occurrence in Buru is I believe more than doubtful.

41. \**EUTHALIA (Lexias) ÆROPUS*, Linnæus.

Recorded from Bourou by Boisduval as *Lexias æropus*, doubtless correctly.

42. *SYMBRENTHIA HIPPOCLUS*, Cramer.

This species was originally described from Amboyna, and is recorded from the Moluccas by Wallace. Cramer's figure is not very good, as it shews the outer-discal series of spots on the underside of both wings, but especially on the hindwing, white instead of pale violet. The female in Buru is yellow.

43. *SALAMIS SABINA*, Cramer.

Both sexes received, apparently common in Buru.

44. *CYRESTIS THYONNEUS*, Cramer.

Boisduval as *Cyrestis thyoneus* [sic!] from Bourou.

## 45. DOLESCHALLIA CRAMERI, Distant.

Mr. W. L. Distant has so renamed Cramer's figure of "*Papilio*" *polibete* from Amboyna, Ex. Lep., vol. iii, pl. ccxxxv, figs. C, D, *male* (1779). My Buru specimens agree very well with this figure, except that the spots on the upperside of the hindwing are black, the posterior one sometimes with a white pupil, instead of blue as figured.

## Family LYCÆNIDÆ.

## 46. GERYDUS LEOS, Guérin.

Both sexes of this species are described, and the female is figured, from Bouron, as "*Simœthus*" *leos*. On the plate the generic name is written "*Symethis*." I have one male only from Buru, but both sexes from South Celebes. It seems to be quite a distinct species, and has been described by Doherty from Sumba and Sambawa as *Gerydus teos* in Journ. A. S. B., vol. ix, pt. 2, p. 185, n. 92 (1891).

## 47. GERYDUS CERAMENSIS, Ribbe.

*Miletus chinensis*, var. *ceramensis*, Ribbe, Iris, vol. ii, p. 247, n. 95, pl. v (nec i), fig. 2, *female* (1889); *Gerydus boisduvalii* [sic!], Moore, var. *acragas*, Doherty, Journ. A. S. B., vol. ix, pt. 2, p. 186, n. 93 (1891).

Described by Herr C. Ribbe from South and East Celebes, Ambon, Saigun, Buru and Borneo. I have both sexes from Buru. The female agrees exactly with the figure of *G. ceramensis*, both sexes with the description of *G. acragas*, so there is but little doubt that the two species are synonymous. *G. acragas* was described from Sumba and Sambawa, and I have recorded it under this name from the Ké Isles, *vide* p. 263, n. 44, *ante*.

## 48. PITHECOPS DIONISIUS, Boisduval.

Common in Buru. The late Herr C. Ribbe recorded it in Iris, vol. ii, p. 250, n. 105 (1889) from Great Ceram as *Plebejus* [sic!] *dionysius* [sic!]; Dr. A. Pagenstecher in Jahr. des Nass. Ver. für Natur., vol. xxxvii, p. 192 (1884) from Amboina as *Cupido dionisus* [sic!].

## 49. LAMPIDES ARATUS, Cramer.

Buru specimens are quite typical.

## 50. LAMPIDES ELPIS, Godart.

Males only received.

## 51. LAMPIDES HYLAS, Cramer.

Herr Ribbe recorded it (l. c., p. 249, n. 102) from Great Ceram as *Plebejus euchylas*, Hübner, but Cramer's name is the older.

## 52. ARRHOPALA HELIUS, Cramer.

Males only received.

## 53. ARRHOPALA FULLA, Hewitson.

Described from Boiron [sic!]. Males only received.

## Family PAPILIONIDÆ.

## Subfamily PIERINÆ.

## 54. \*TERIAS ZORAIDE, Felder.

Dr. A. G. Butler in Ann. and Mag. of Nat. Hist., seventh series, vol. i, p. 59, n. 4 (1898), says that *T. zoraide* "Ranges from Bourou southwards to Australia." I have not received this species from Buru, but Australian specimens appear to me to be quite the same as *T. libythea*, Fabricius, which is much the older. Wallace records *T. drona*, Horsfield, from Bouru, that species being a synonym of *T. libythea*. Wallace's *T. drona* from Buru probably now stands in the collection of the British Museum as *T. zoraide*.

## 55. TERIAS CANDIDA, Cramer.

Recorded by Wallace from Bouru, and by Dr. Butler (l. c., p. 61, n. 11) from Amboyna and Ceram. I have females only from Buru, which agree absolutely with females from the Ké Isles.

## 56. TERIAS BIFORMIS, Butler.

Originally described from both sexes from Amboina. I have three females only from Buru, which are creamy-white on both surfaces. It is described and figured by Mr. Distant from Singapore as *T. lacteola*, but the Malay Peninsula is not given as one of the habitats of the species by Dr. Butler in his latest revision of the genus. Such white females occur sporadically in India, and in my opinion are only occasional "sports" of *T. hecabe*, Linnaeus. As, however, I have no yellow females from Buru, I retain Dr. Butler's name for the species, which he says "Ranges from Nias through Borneo eastwards to Ternate and Batchian, extending south to Amboyna and Ceram, and probably crossing New Guinea, to reappear in the Louisiade and Solomon groups" (Ann. and Mag. of Nat. Hist., seventh series, vol. i, p. 76, n. 53 (1898)). The male as described is "bright lemon-yellow" coloured. Wallace probably recorded this species from Bouru as



*T. blanda*, Boisduval, which is given by Butler as a synonym of *T. hecabe*, Linnæus.

Wallace describes *T. diversa* from Bouru and six other localities. Butler (l. c., p. 74, n. 50) restricts it to the Philippines.

Dr. Butler (l. c., p. 76, n. 52) says that *T. brevicostalis*, Butler, is probably found in Bourou, but I have not received it from thence.

57. *CATOPSILIA CROCALE*, Cramer.

Recorded by Wallace in Trans. Ent. Soc. Lond., third series, vol. iv, p. 413 (1867) from Bouru as "*Callidryas*" *alceone*, Cramer. One very heavily-marked female only received, which, however, is not as darkly coloured as Dr. Butler's figure of the same sex of his "*Callidryas*" *flava* (Lep. Ex., p. 23, n. 2, pl. ix, fig. 5, female (1869)). Dr. Butler does not say whence the specimen he figured came, but he gives Celebes (Macassar), Ceram and Batchian for *C. flava*. I quite agree with his remark "This species may eventually turn out to be an extreme form of *C. crocale*."

58. \**HEBOMOIA LEUCOGYNIA*, Wallace.

Described from Bouru by Wallace as "*Iphias*" *leucogynia*, and apparently confined to that island. Dr. Adolf Fritze discusses this species in his interesting paper on the genus *Hebomoia* (Zool. Jahr., vol. xi, p. 278 (1898)).

59. \**ELODINA BOURUENSIS*, Wallace.

Originally described from Bouru.

60. \**HUPHINA RACHEL*, Boisduval.

Recorded from Bouru by Wallace as "*Pieris*" *rachel*.

61. \**HUPHINA JAEL*, Wallace.

Described from Bouru by Wallace as "*Pieris*" *jael*.

Boisduval describes a "*Pieris*" *theodice* from Bourou, but this locality is probably incorrect. Mr. Kirby records it from Chili and Peru.

62. \**APPIAS ADA*, Cramer.

Recorded from Bouru by Wallace as "*Tachyris*" *ada*.

63. \**APPIAS ALBINA*, Boisduval.

Males and white females (Form I) recorded from Bouru by Wallace as "*Tachyris*" *paulina*, Cramer, the latter being found only in Ceylon.

## 64. \*APPIAS LEIS, Hübner.

Recorded from Bouru by Wallace as "*Tachyris*" *jacquinotii*, Lucas, which species is, in my opinion, a synonym of *A. leis*.

## 65. \*APPIAS CYNISCA, Wallace.

Described by Wallace from Bouru from the female sex only as "*Tachyris*" *cynisca*.

## 66. \*APPIAS BOURUENSIS, Wallace.

Described from a unique female from Bouru by Wallace as "*Tachyris*" *bouruensis*.

## 67. DELIAS PHILOTIS, Wallace.

Both sexes described from Bouru by Wallace. My male specimens are a little variable, in some there is a small white spot at the posterior end of the discoidal cell of the forewing on the underside, in others it is absent. This is probably the species Boisduval records from Bourou as "*Pieris*" *phillyra* [sic!], Godart, which equals *D. cæneus*, Linnæus.

## 68. DELIAS ECHO, Wallace.

Described from Bourou by Wallace.

## Subfamily PAPILIONINÆ.

## 69. TROIDES OBLONGOMACULATUS BOURUENSIS, Wallace.

Males only received. This must be the species Boisduval recorded from Bourou as *Ornithoptera hellen*.

## 70. PAPILIO POLYDORUS, Linnæus.

Apparently the commonest species of the genus in Buru.

## 71. PAPILIO FUSCUS, Goeze.

A variable species even in a comparatively small island like Buru. Herr Ribbe records it from Buru under its synonym *P. cinereomaculatus*, Goeze.

## 72. \*PAPILIO GAMBRISIUS, Cramer.

Recorded from Buru by Wallace, Oberthür and Rothschild.

## 73. PAPILIO DEIPHOBUS, Linnæus.

Apparently not rare in Buru, from whence it has been recorded by many authors.

## 74. \*PAPILIO DEIPHONTES, Felder.

The Hon. Walter Rothschild draws especial attention to the fact

that Mr. Doherty on his first visit to Buru obtained both *P. deiphobus*, Linnæus, and *P. deiphontes* on that island (Nov. Zool., vol. ii, p. 326 (1895)). I have only received three males of the former species, all of which have long tails; the latter species, which I have only from Ternate and Halmahera, has no distinct tail, only a tooth.

75. \*PAPILIO POLYTES ALPHENOR, Cramer.

Not received by me.

76. \*PAPILIO EURYPYLUS, Linnæus.

Not received by me.

77. \*PAPILIO SARPEDON ANTHEDON, Felder.

Recorded from Bourou by Boisduval as *P. sarpedon*, Linnæus.

78. PAPILIO AGAMEMNON PLISTHENES, Felder.

Females only received. All the species in this subfamily given above have been recorded from Buru by the Hon. Walter Rothschild.

Family HESPERIIDÆ.

79. TAGIADES METANGA, Ribbe.

*T. neira*, Plötz, var. *metanga*, Ribbe, Iris, vol. ii, p. 265, n. 143, pl. v, fig. 8 (1889).

I do not know *T. neira*, Plötz, which was described from the Aru islands. The var. *metanga* was described from Great Ceram. My two females agree very well with the figure of the latter.

80. TAGIADES JAPETUS, Cramer.

Both sexes of this widely-distributed species received.

81. NOTOCRYPTA FEISTHAMELII, Boisduval.

Described as "*Hesperia*" *feisthamelii*, Boisduval, from Amboina and Bourou. In the text of "Voyage de l'Astrolabe," Entomologie, part 1, p. 159 (1832), the reference to the plate and figure is incorrect, it should be plate iii instead of ii, and figure 6 instead of 7. The late Herr C. Ribbe in Iris, vol. ii, p. 263, n. 142, pl. v, fig. 7 (1889), describes and figures what appears to be a female of this species from Great Ceram as "*Plesioneura*" *varians*. My females from Buru agree exactly with Herr Ribbe's figure. The "*Plesioneura*" *chimæra* of Plötz, Berl. Ent. Zeitsch., vol. xxvi, p. 262, n. 4 (1882), described from "India," is also a synonym. Herr G. Weymer has kindly sent me a coloured drawing of a specimen of *P. chimæra* identified by the late Herr Plötz himself. On the underside of the forewing as drawn the discal white fascia ends anteriorly at the subcostal nervure as in *N. restricta*, Moore.

## 82. TELICOTA BAMBUSÆ, Moore.

The male specimens from Buru have the sexual brand on the upperside of the forewing very prominent, whitish and shining. The late Herr C. Ribbe sent me a female of this species from Ceram named "*Pamphila*" *ahrendti*, Plötz, and under this name the species stands in *Iris*, vol. ii, p. 261, n. 136 (1889). It was originally described as "*Hesperia*" *ahrendti* from Manila in the Philippines, but is not mentioned in Herr Georg Semper's "*Schmetterlinge Philippinischen Inseln*." On l. c. pl. v, fig. 5, Herr Ribbe figures a *Pamphila arendti* [sic], but this figure does not in the least agree with *T. bambusæ*.

## 83. TELICOTA AUGIAS, Linnæus.

Males only received. The discal oblique black fascia bearing the sexual brand on the upperside of the forewing is unusually narrow in these specimens, consequently the golden-yellow band beyond is unusually broad.

84. TELICOTA (*Padraona*) PRUSIAS, Felder.

Females only received, which agree exactly with specimens of the same sex in my collection from the Philippines and Celebes.

85. TELICOTA (*Padraona*) PALMARUM, Moore.

Males only received. These specimens do not agree with Felder's figure of "*Pamphila*" *augiades*, male, from Amboina. That species, which I have never succeeded in obtaining, is very closely allied to *T. palmarum*.

## 86. OCYBADISTES MARNAS, Felder.

My male specimens from Buru and Waigiou (Waijiu or Waigen) agree very well with Messrs. Elwes and Edwards' description of "*Pamphila*" *marnas*, Felder (described originally from Amboina), in *Trans. Zool. Soc. Lond., Zoology*, vol. xiv, p. 256 (1897). Messrs. Elwes and Edwards ignore Mr. Heron's genus *Ocybadistes*, although it was described in 1894, and place the present species in the genus *Telicota*, though Capt. Watson pointed out in 1893 that *P. marnas* and some other species were not true *Telicotas*.

87. BAORIS (*Chapra*) MATHIAS, Fabricius.

My male specimens from Buru have no translucent spots whatever in the forewing, though the usual discal spots appear on the underside but are opaque, while the females are normal.

88. BAORIS (*Parnara*) PHILIPPINA, Herrich-Schäffer.

Both sexes received. It seems to be common in Buru.

89. BAORIS (*Parnara*) CONTIGUA, Mabille.

Two males of this variable and widely-spread species from Buru have been received. In both examples the two spots in the discoidal cell of the forewing are well separated, but this is a very inconstant feature; in one specimen there is a single spot, in the other two spots only, on the disc of the hindwing, the normal number being four.

90. HASORA (*Parata*) CELENUS, Cramer.

Originally described from what appears to be a male (though the sexual brand is not figured) from Amboyna. I have both sexes from Buru. The female shews in a good light on the upperside of both wings a very magnificent plumbeous gloss, which is entirely wanting in the male. The coloration of both wings on the underside is in the female of a much paler and lighter shade than in the male, and green instead of purple. *Hasora violacea*, Elwes and Edwards, Trans. Zool. Soc. Lond., vol. xiv, pp. 297, 299 (1897), from Amboina, is said to be allied to *H. celenus*, but the male differs from that species as identified by me in having no sexual brand.

91. HASORA (*Parata*) MALAYANA, Felder.

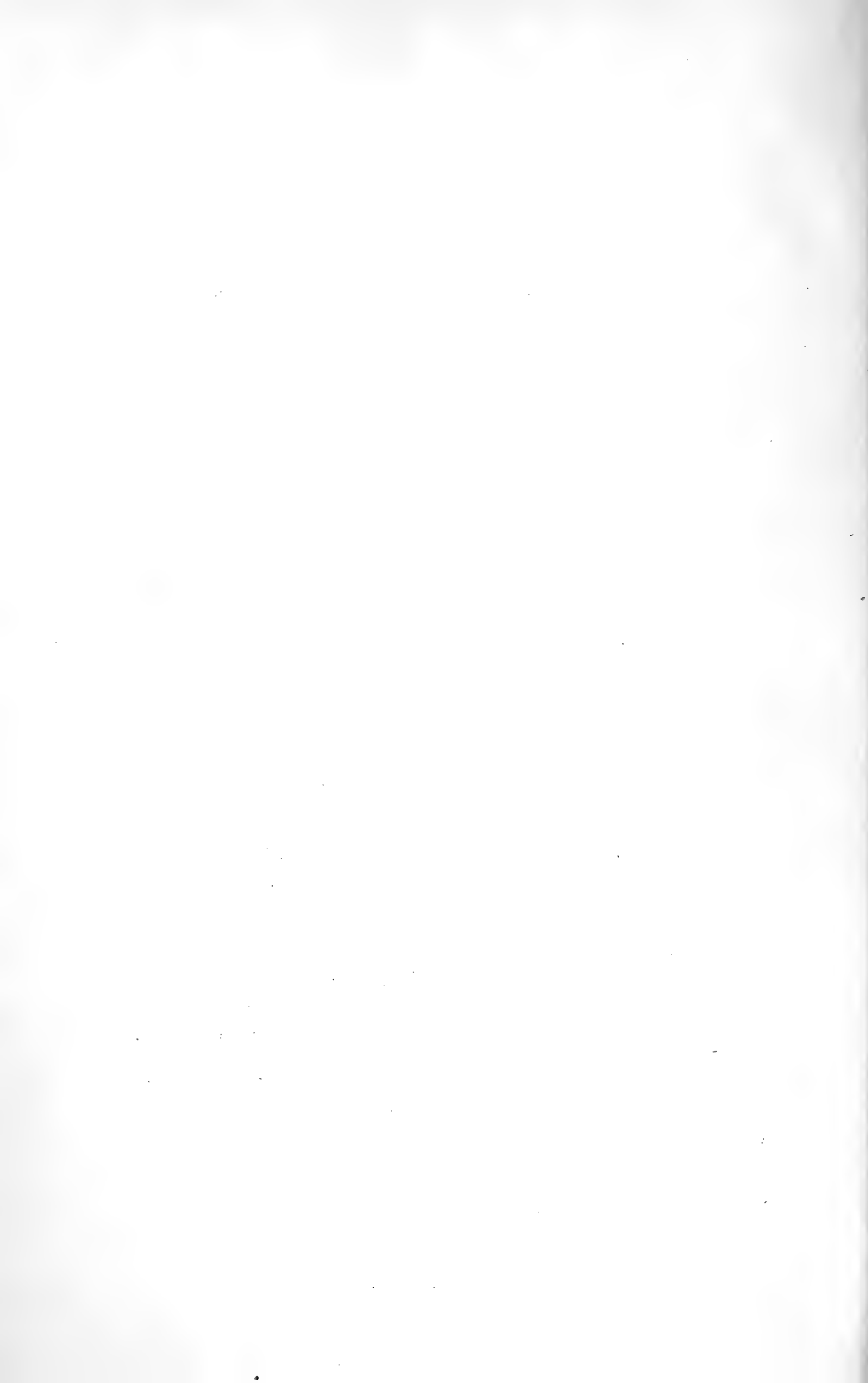
Two females only received from Buru. Like examples from the Ké Isles, these Buru specimens are without spots on the forewing.

92. HASORA (*Parata*) HURAMA, Butler.

Both sexes received from Buru, which differ the one from the other only in the presence in the male of the sexual brand on the upperside of the forewing, this being absent in the female.

## 93. \*HASORA THRIDAS, Boisduval.

Described from Bourou as "*Thymèle*" *thridas* by Boisduval. As far as Boisduval's short description goes it agrees with the specimens I have identified as *H. malayana*, Felder. But Watson says in Proc. Zool. Soc. Lond., 1893, p. 128, that *H. thridas* comes into group A of the genus in which the sexual brand in the male is either inconspicuous or entirely absent, while the male of *H. malayana* has it conspicuous, and comes into his group B.



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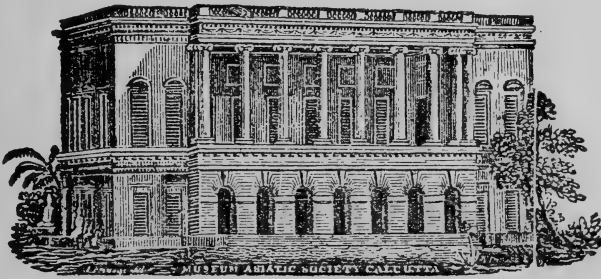
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OF THE

## ASIATIC SOCIETY.



The *Proceedings* of the Asiatic Society are issued ten times a year as soon as possible after the General Meetings which are held on the first Wednesday in every month in the year except September and October; they contain an account of the meeting with some of the shorter and less important papers read at it, while only titles or short resumés of the longer papers, which are subsequently published in the *Journal*, are given.

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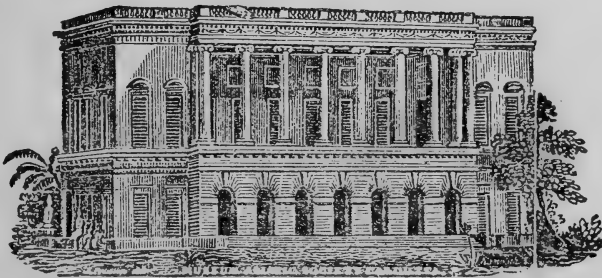
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Plate I will be issued with a subsequent number.

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# NOTE ON THE PUBLICATIONS

OF THE

## ASIATIC SOCIETY.



The *Proceedings* of the Asiatic Society are issued ten times a year as soon as possible after the General Meetings which are held on the first Wednesday in every month in the year except September and October; they contain an account of the meeting with some of the shorter and less important papers read at it, while only titles or short resumés of the longer papers, which are subsequently published in the *Journal*, are given.

The *Journal* consists of three entirely distinct and separate volumes: Part I, containing papers relating to Philology, Antiquities, etc.; Part II, containing papers relating to Physical Science; and Part III devoted to Anthropology, Ethnology, etc.

Each Part is issued in four or five numbers, and the whole forms three complete volumes corresponding to the year of publication.

The *Journal* of the Asiatic Society was commenced in the year 1832, previous to which the papers read before the Society were published in a quarto periodical, entitled Asiatic Researches, of which twenty volumes were issued between the years 1788 and 1839.

The *Journal* was published regularly, one volume corresponding to each year from 1832 to 1864; in that year the division into two parts above-mentioned was made and since that date two volumes have been issued regularly every year. From 1894 an additional volume, Part III, has been issued.

The *Proceedings* up to the year 1864, were bound up with the *Journal*, but since that date have been separately issued every year.

The following is a list of the Asiatic Society's publications relating to Physical Science, still in print, which can be obtained at the Society's House, No. 57, Park Street, Calcutta, or from the Society's Agents in London, Messrs. Luzac & Co., 46, Great Russell Street, W. C.; and from Mr. Otto Harrassowitz, Leipzig, Germany.

ASIATIC RESEARCHES. Vols. VII, Vols. XIII and XVII, and  
Vols. XIX and XX @ 10/ each Rs. 80 0  
PROCEEDINGS of the Asiatic Society from 1865 to 1869 (incl.) @  
/6/ per No.; and from 1870 to date @ /8/ per No.  
JOURNAL of the Asiatic Society for 1843 (12), 1844 (12), 1845  
(12), 1846 (5), 1847 (12), 1848 (12), 1850 (7), 1851 (7), 1857 (6),

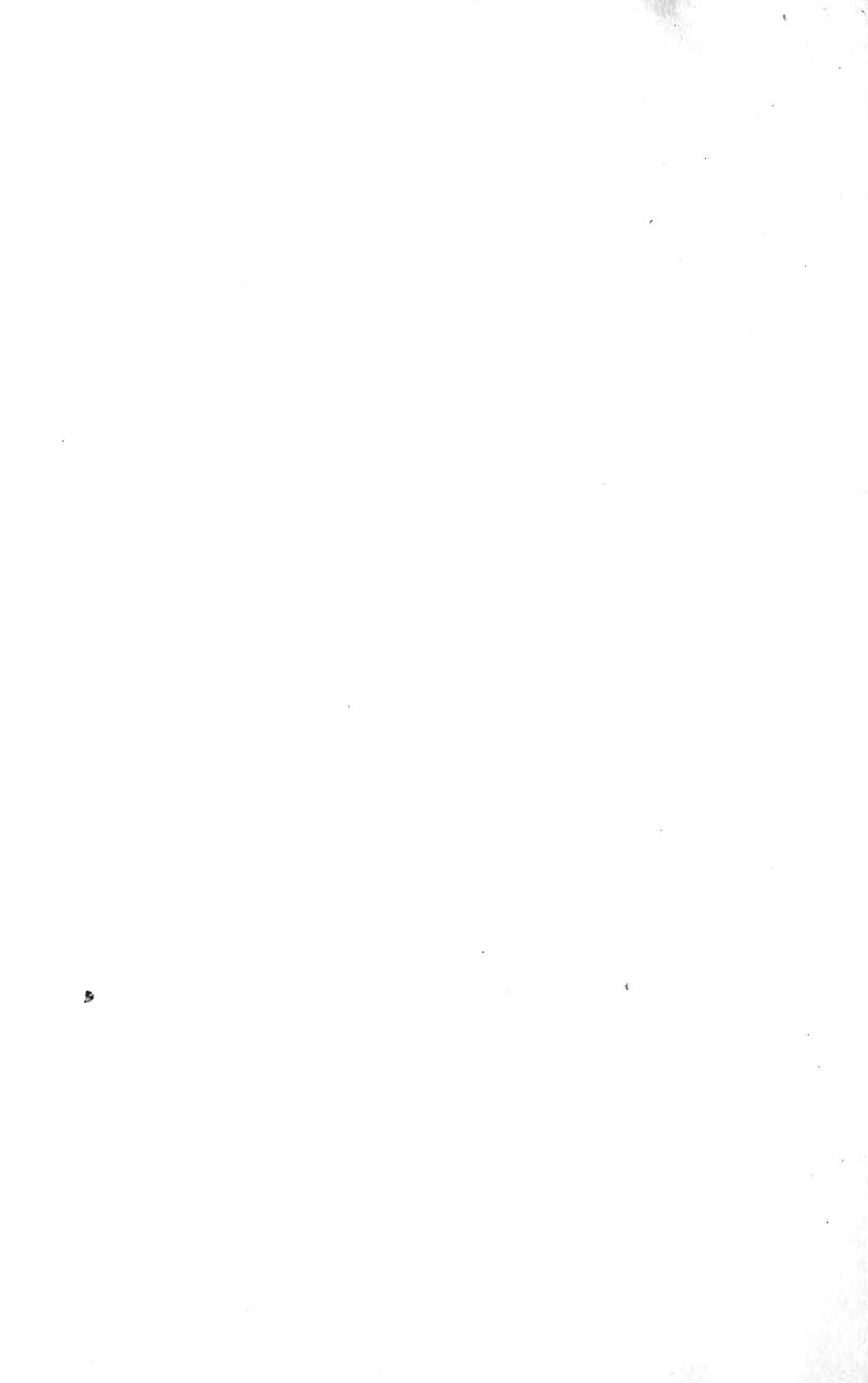
1858 (5), 1861 (4), 1862 (5), 1864 (5), 1866 (7), 1867 (6),  
 1868 (6), 1869 (8), 1870 (8), 1871 (7), 1872 (8), 1873 (8),  
 1874 (8), 1875 (7), 1876 (7), 1877 (8), 1878 (8), 1879 (7),  
 1880 (8), 1881 (7), 1882 (6), 1883 (5), 1884 (6), 1885 (6),  
 1886 (8), 1887 (7), 1888 (7), 1889 (10), 1890 (9 and 2 Sup-  
 plts.), 1891 (7), 1892 (7 and Suppl.), 1893 (11), 1894  
 (8), 1895 (7), 1896 (8), 1897 (8), @ 1/8 per No. to Members  
 and @ 2/ per No. to Non-Members.

*N. B.—The figures enclosed in brackets give the number of  
 Nos. in each Volume.*

Centenary Review of the Researches of the Society from 1784 to 1883	...	...	...	...	...	Rs.	3	0
Theobald's Catalogue of Reptiles in the Museum of the Asiatic Society (Extra No., J. A. S. B., 1868)	...	...	...	...	...		2	0
Catalogue of the Mammals and Birds of Burmah, by E. Blyth (Extra No., J. A. S. B., 1875)	...	...	...	...	...		4	0
Catalogue of Fossil Vertebrata	...	...	...	...	...		3	0
Catalogue of the Library of the Asiatic Society, Bengal	...	...	...	...	...		3	8
Moore and Hewitson's Descriptions of New Indian Lepidoptera, Parts I-III, with 8 coloured Plates, 4to. @ 6/ each	...	...	...	...	...		18	0









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